JULY
1961

FOUNDRY

A PENTON PUBLICATION

New Brass Foundry Anticipates Market Growth

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- Handling Diecastings in a Jobbing Shop — Page 52
- Volkswagen Foundry Output Is Diversified — Page 56
- A Castings User Looks at Quality Control — Page 62
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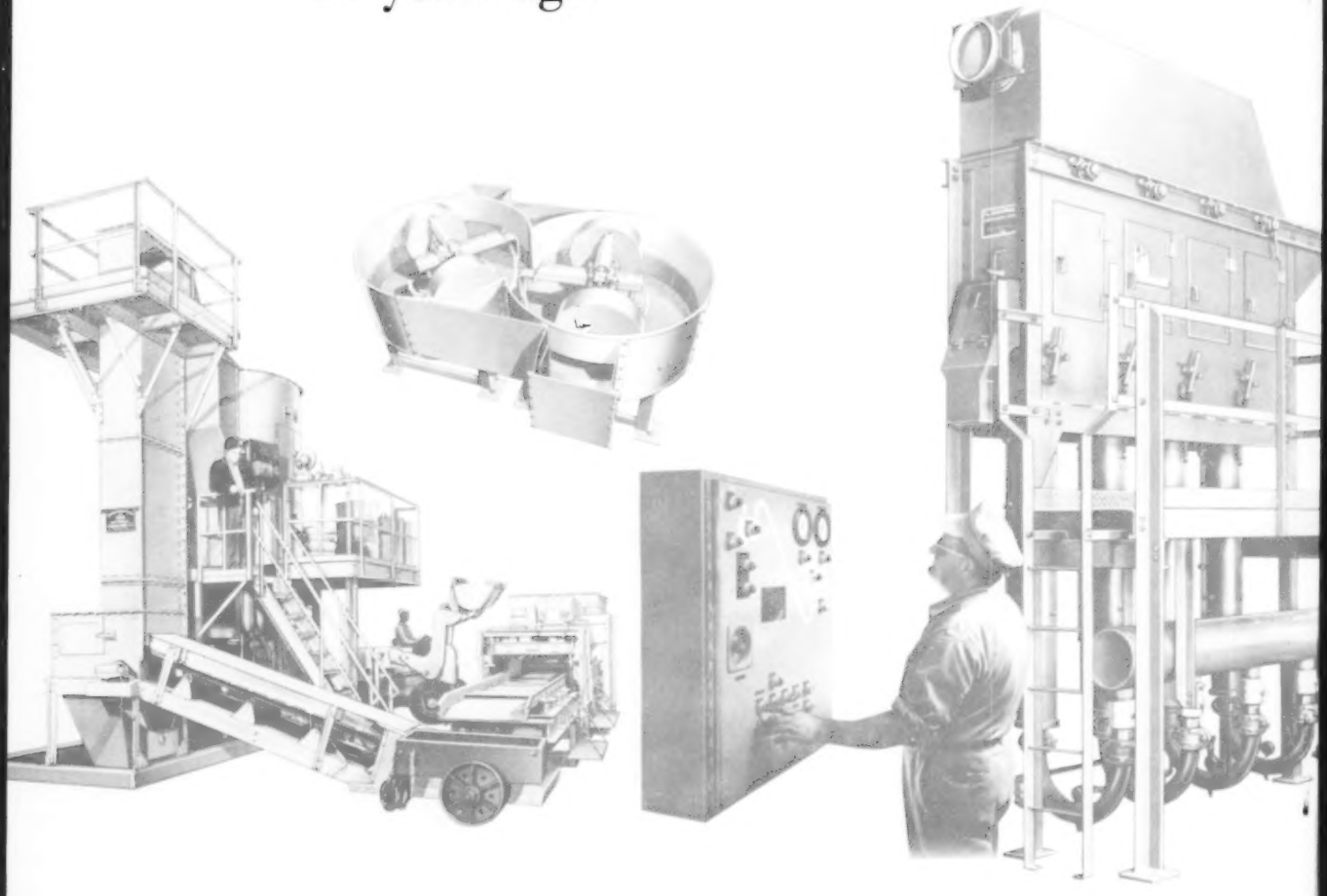
Foundrymen are winning the battle of profit vs. cost with National equipment that was only an idea 10 years ago.



National prospers only as foundrymen prosper . . . through the acceptance of improved technology and the development and use of equipment designed to reduce the cost of processing and handling your most expensive commodity: SAND.

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For More Information Circle 551, Page 39

F-761

NEW FROM REYNOLDS,

ONLY* FROM REYNOLDS . . .

A357 Aluminum Casting Alloy

An Economical Beryllium-Aluminum Casting Alloy

To keep your casting costs down—Reynolds has developed a new outstanding alloy with the key characteristics of TENS 50. Check its specifications and check these characteristics that add up to maximum quality at a cost 30% less than earlier Beryllium added aluminum casting alloys.

- **Superior Strength**
- **Extended Elongation**
- **The Best In Fluidity and Castability**
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- **Extended Limits For Shock and Impact**

A357 Sand and Permanent Mold "T6" Heat Treatment Properties		
	Sand	Permanent Mold
Tensile Strength (PSI)	48.0	53.0
Yield Strength (PSI)	36.0	41.0
Elongation	3%	12%

* Reynolds Metals Company and their Distributors are the only source for TENS 50 and A357 alloys. For complete information, write to *Reynolds Metals Company, P. O. Box 2346-FL, Richmond 18, Virginia.*

A357 alloy is covered under TENS 50 Patents granted to Navan Products, Inc., a division of North American Aviation, Inc. and licensed to Reynolds Metals Company.

REYNOLDS ALUMINUM

Watch Reynolds TV Show "Harrigan & Son", Fridays—ABC-TV

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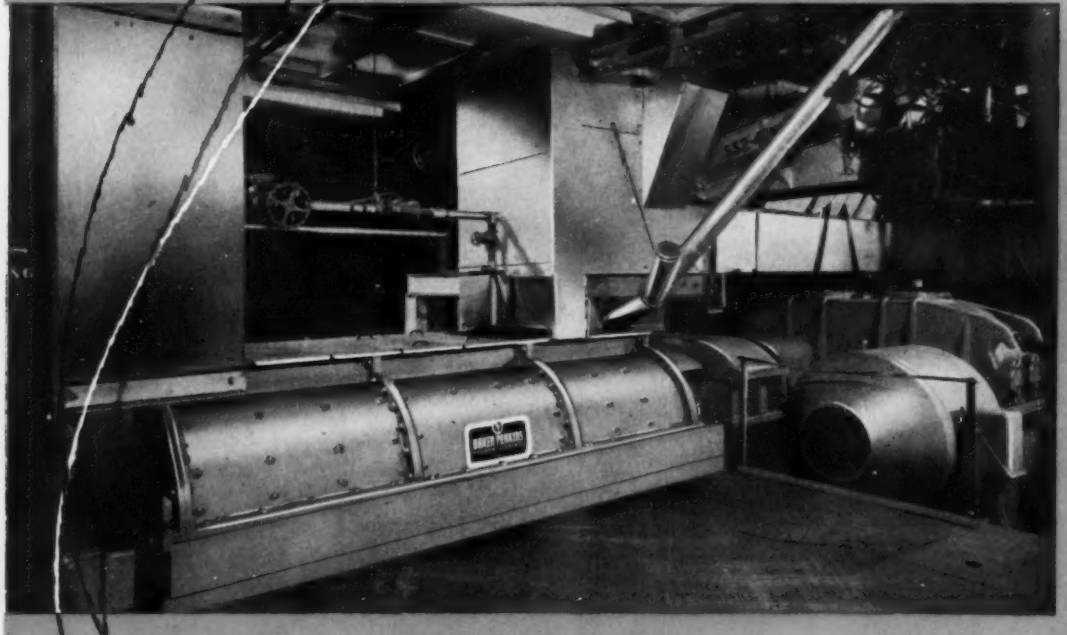
NOW . . .
a single B-P Continuous Muller handles 300 tons of sand per hour



The new Baker Perkins Size 8 Muller, now in successful operation in one of the midwest's automotive foundries, has 300% more hourly capacity than any available batch type muller and 100% more capacity than the next size B-P continuous unit. As with all B-P Continuous Mullers, cleaner, smoother castings are obtained with fewer rejects because molding sands are thoroughly mixed and tempered. The special Sigma-type agitators assure that each grain of sand is coated with the correct proportion of bond.

Baker Perkins builds Continuous Mullers in capacities from 30 to 300 tons per hour. Because of their rigid, rugged construction, B-P Continuous Mullers give many years of service. Installations in many of America's largest foundries have proven the efficiency of Baker Perkins Continuous Mullers under the most exacting conditions.

For further information about B-P Continuous Foundry Sand Mullers and B-P Unidor mixers for core and special process sand mixing, send for catalog No. F-156.

371

BAKER PERKINS INC.

FOUNDRY MACHINERY DIVISION • SAGINAW, MICHIGAN

Sizable banks of castings are required to support a daily production of 4000 engines at the Volkswagen plant in Hanover, Germany. (See Page 56.) Cast parts are made of magnesium, gray iron, aluminum, and zinc.

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THE EDITORS' WORKSHOP

FOREIGN PRACTICE: Two important foundry technical meetings were held in Europe recently—the annual conference of the Institute of British Foundrymen at Cheltenham and the International Foundry Congress in Vienna. FOUNDRY will be bringing you authoritative reports on the technical discussions presented at these meetings. Watch for their appearance in coming issues.

INGOT MOLDS: Good foundry practice is necessary to maintain quality and control costs in production of the cast iron ingot molds and

stools used by steel mills. Because these products are important items in the cost of steelmaking, Lone Star Steel Co. at Lone Star, Tex., has given special attention to its mold casting practice. R. C. Harrell, superintendent of foundries, will describe the operations next month.

GATES & RISERS: Our comprehensive series of articles on gating and risering takes up aluminum permanent mold castings next month. The discussion was prepared by George A. Bier, Polymet Co., Orange, N. J. Succeeding articles will cover gray iron, zinc diecastings, and magnesium diecastings.

This fine series, which began in October, 1959, has proved so popular that our supply of tearsheets of all but the most recent articles is exhausted. The authors can be proud of the good job they have done.

Aeroquip Introduces New Low-Cost Reusable Fitting for High Pressure Hose Lines

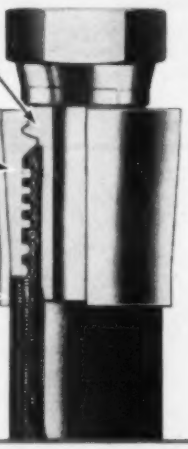
How IRON MIKE Fitting Grips Hose

NIPPLE
Designed to fit into hose without cutting inner tube. Available in 10 end fitting styles.

SEGMENTS
Grip hose reinforcement securely, mate with nipple assembly for correct positioning.

SOCKET
Forced over segments during assembly to form a rugged compression fitting that won't blow off.

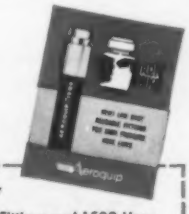
PATENT APPLIED FOR



Meet IRON MIKE, a rugged new hose fitting that provides all the field service advantages and replacement economy of reusable fittings—at rock-bottom prices. Hose assemblies made with IRON MIKE Reusable Fittings compare in cost with assemblies made with non-reusable fittings. Design is so simple that foolproof assemblies can be made by factory or service personnel in minutes.

IRON MIKE Fittings have been field tested for more than a year to assure traditional Aeroquip performance and dependability. Used with Aeroquip 1509 Multiple Wire Braid Hose, they are recommended for all industrial high pressure hydraulic applications up to 2250 psi. as well as pneumatic, fuel and lubrication systems. IRON MIKE Fittings are available in ten standard end styles for hose sizes from ¾" to 2" I.D.

Mail coupon below for new Aeroquip Product Bulletin No. 651, or call your local distributor listed in the yellow pages.



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AT THE HEART OF INDUSTRY...

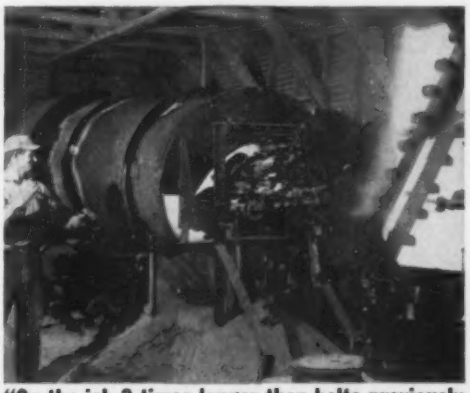
A murderous combination meets its master in this leading Southern foundry as U.S. FoundryGiant RipStop Conveyor Belts withstand hot foundry sand loaded with jagged pieces of cherry-red tramp iron...last 8 times longer than other belts. Special internal wire ribs prevent jagged pieces of metal flash, sprues, gates, and other abrasive material from tearing and wrecking the belt.

CS 114

Wherever you find the tough and demanding industrial tasks, you'll find US Industrial Rubber Products helping to make them easier and more efficient. As the world's largest producer of Industrial Rubber Products, US knows and can meet the needs of all industry.

Chosen for overall top performance, U. S. Royal V-Belts drive the edger blade on Western Tool & Stamping Company's powerful Edger-trimmer. These belts must withstand oil, dust, weather, and twisting. They must also deliver top performance at many different engine speeds. U.S. Royal V-Belts do the job . . . were chosen because they outperformed all competitive belts.

VB 154



"On the job 3 times longer than belts previously used," says a co-owner of a Texas producer of foundry, chemical, and specialized sands about US HTB Elevator Belts. "We need belts that give long service at heats to 450°F, withstand terrific weight plus the abrasive action of sand. US Belts have never failed . . . never caused lost production or downtime."

CB 112

Globe-Union cuts downtime by 25% with US Flexible Couplings, used to couple electric motors with pumps driving molten lead up a 45° incline. Stopping and starting every two minutes, operating near equipment at 800°F, these unique couplings never need lubrication, compensate for misalignment, and cushion shocks to protect both motors and equipment.

FC 104

For every industrial rubber product need, turn to US. For Conveyor Belts, V-Belts, the original PowerGrip "Timing"® Belt, Flexible Couplings, Mountings, Fenders, Hose and Packings . . . custom-designed rubber products of every description. Discover why U.S. Rubber has become the largest developer and producer of industrial rubber products in the world. See your U.S. Rubber Distributor or contact US directly at Rockefeller Center, New York 20, N. Y.

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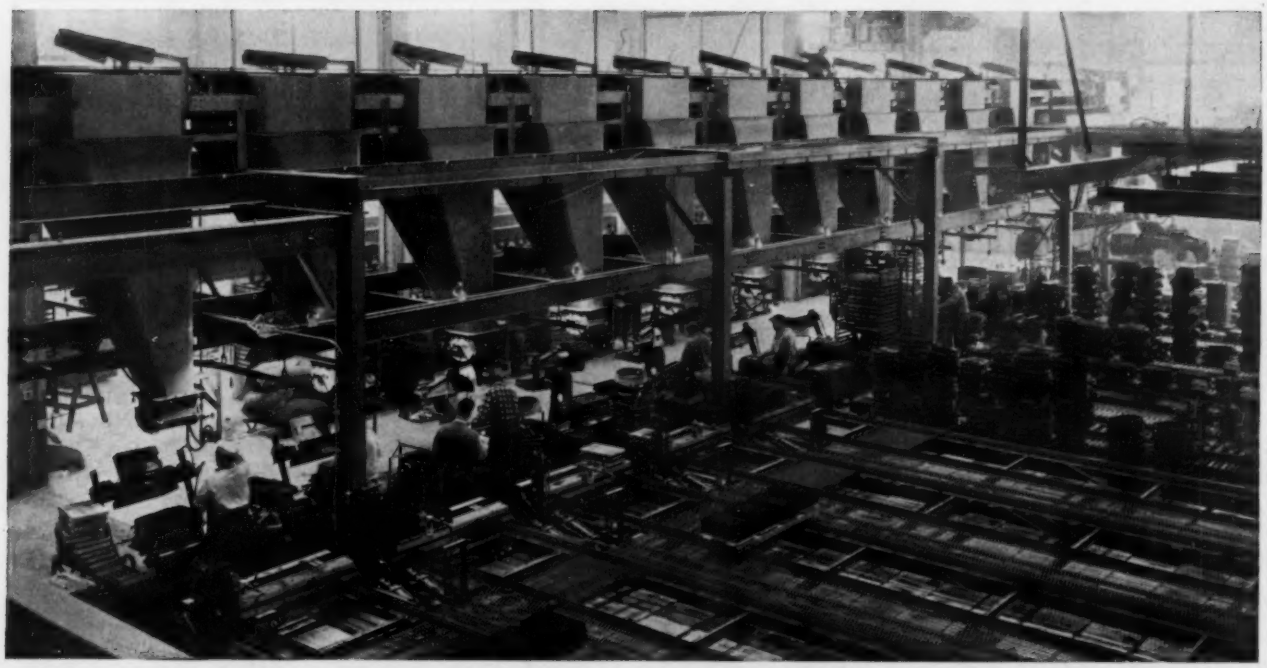
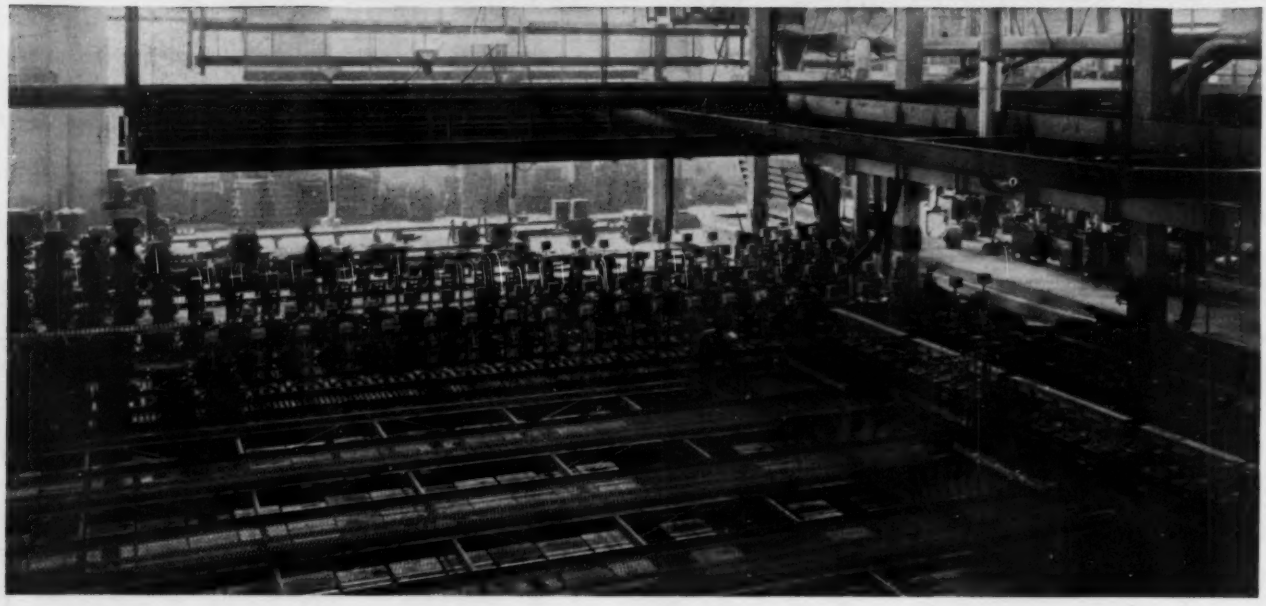




Jeffrey mechanizes new foundry at Neptune

This completely new bronze foundry at Maspeth, New York, is an example of how Jeffrey engineering and equipment can be applied to modernize foundry operations. Neptune Meter Company, the nation's oldest and largest manufacturer of liquid meters, called on Jeffrey for complete engineering layout and installation of a highly mechanized bronze foundry system in their new facility.

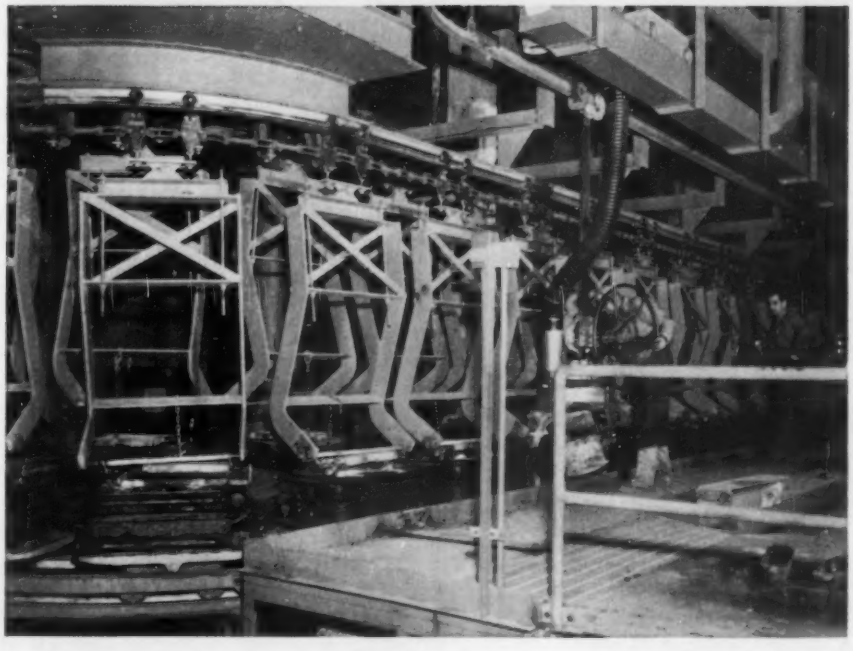
This foundry utilizes both conventional and automatic molding. Jeffrey units help maintain high effi-

Conventional molding

Jeffrey distributing belt conveyor delivers prepared sand to each molder's station through automatic plows. Pallets carry completed molds from molding stations through pouring to automatic dumping station. Empty pallets are returned automatically on lower level to molders. Sand and castings are carried on Jeffrey vibrating conveyors to shakeout and apron conveyor carries finished castings from shakeout through sorting.

Automatic molding

Automatic molding machine makes molds which are placed on Jeffrey mold conveyor with automatic weight conveyor and continuous pouring conveyor.



Meter with efficient, modern equipment

ciency on both molding systems, as well as charging, metal handling and conveying systems. Jeffrey foundry engineers supervised engineering through installation, staying on the job until the foundry was in production.

Incorporated into the layout are Jeffrey apron, belt, vibrating, pallet and continuous mold conveyors handling materials from raw sand through finished castings, as well as charging and metal handling equipment.

Consult Jeffrey Foundry Engineers for cost-cutting ideas in sand handling and conditioning, mold preparation, casting handling, and for special unit machines. Catalog 911 describes these services. The Jeffrey Manufacturing Company, 907 North Fourth Street, Columbus 16, Ohio.

If it's conveyed, processed or mined, it's a job for Jeffrey.

JEFFREY

For More Information Circle 557, Page 39

KOZMA

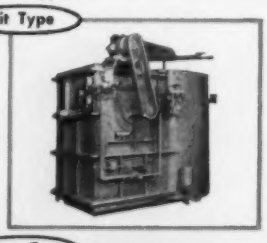
Eventemp

RECIRCULATING FURNACES

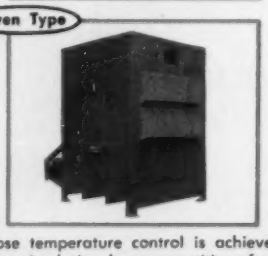
- Close temperature control
- High efficiency
- Push-button operation
- Gas fired or electric

Kozma Eventemp Recirculating Furnaces, Pit Type or Oven Type, are your most logical selection for efficient, drawing, tempering, or stress relieving — heating aluminum for forging — solution heat treating and aging of aluminum — heat treating of brass and copper.

Pit Type



Oven Type



Close temperature control is achieved by recirculating large quantities of air at high static pressure. All parts of the load come to temperature together. Overheating of the work is eliminated as air temperature is measured before it passes through the load.

Eventemp furnaces are equipped with fan and combustion safeguards. This equipment is factory-installed in a pre-wired control cabinet ready for swift, easy installation.

Efficiency is high since combustion chamber, fan, and work chamber are all within one well-insulated shell.

Write today for complete details on how Eventemp Furnaces can increase your production and reduce costs.

J. A. KOZMA Company
2471 WYOMING
DEARBORN, MICHIGAN

Industrial Processing Furnaces ... since 1928

For More Information Circle 558, Page 39

With the EDITORS

CREATING AN IMAGE: The Malleable Castings Council is completing the third successful year of its excellent advertising program. A new program, to start Nov. 1, will be submitted to the member companies this summer.

During the last three years, surveys show that approximately 3,150,000 people saw and remembered these advertisements for malleable castings. In that period, 6750 persons contacted the council for more information. These were in addition to those contacting directly the members, whose names have been listed in each advertisement.

In addition to developing new business, this fine program has strengthened the opinion of present users on the availability and excellent properties of malleable iron castings. The image of a progressive industry has broadened greatly.

Congratulations to the council on one of the outstanding programs in the entire industrial field.

Toy Banks: Citizens of Cleveland recently were permitted to see a display of authentic old time cast iron banks in the window of the Euclid Ave. branch of Central National Bank. The display was provided by Henry Trenkamp Jr., Taylor & Boggis Foundry Co. Inc., Cleveland. The banks were collected while Mr. Trenkamp was with the former Ohio Foundry Co.

I was pleased to find that a part of the display consisted of pages from the April, 1947 issue of FOUNDRY carrying an article "Where Are the Toy Banks of Yesteryear?" by the late Pat Dwyer, engineering editor of FOUNDRY. In case you have old copies and want to look up this article, the first section appears on page 116 of the April issue and the second on page 84, May issue, 1947.

A Little Plus: How do you go about putting appeal into a display of castings designed to interest the general public? Recently I saw two display cases, side by side, which provided an interesting contrast in exhibit techniques.

One case provided a display of pearlitic malleable iron castings. They were partially machined and the unmachined surfaces were

LOADING VWs: Bill Gude, *Foundry* editor, left, on a recent trip to Germany, watches the dispatch of autos at the Volkswagen plant in Wolfsburg. His interesting article on this company starts on Page 56. With him, left to right, are Arthur Railton, Volkswagen of America Inc.; editor Miles Rowan, *Modern Materials Handling*; managing editor Andy Ashburn, *American Machinist*

BETTER
METAL CASTING WITH
HARBISON-WALKER
REFRACTORY MOLD MATERIALS

H-W Flintgrain for ceramic shell molds

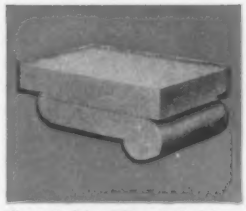
H-W FLINTGRAIN is an alumina-silica product of high refractoriness having very desirable low thermal expansion characteristics.

The angular grain shape and optimum size distribution make H-W FLINTGRAIN ideal for securing maximum compactness in the mold. It is used with special benefit for making ceramic shell molds and for similar applications in which dense, compact mold sections of greatest volume stability at all temperatures are of paramount importance.

Illustration of angulate shape of H-W Flintgrain enlarged x3

H-W Mullite Grains and Flours for precision molding of metals at extremely high temperatures

These H-W Mullite products by virtue of their high-alumina composition and low content of basic oxides are exceedingly refractory. The hard dense grains are strong and most resistant to fluxing. Excellent thermal stability accounts for their unusual constancy of volume up to their temperature limit. The maximum thermal expansion of these mullite products is approximately 0.6 per cent which is less than half that of silica sand. These are the properties which make them especially suitable for precision casting work at high temperatures with particular benefit for various non-ferrous and ferrous alloys.

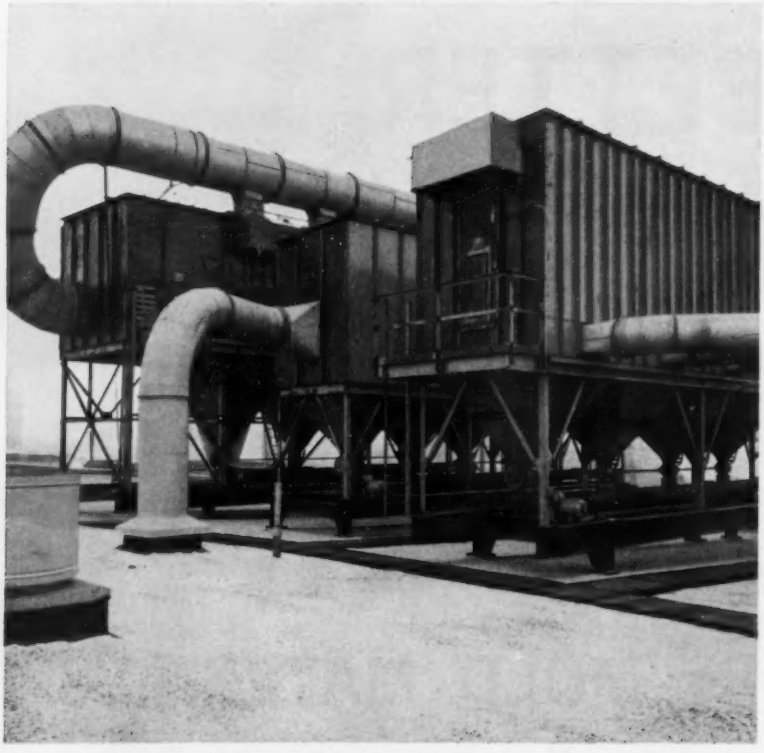


Illustrated here is a typical two-part mold in H-W Mullite material made for the precision casting of a beryllium-copper alloy.

HARBISON-WALKER REFRACTORIES CO. and subsidiaries

World's Most Complete Refractories Service GENERAL OFFICES: PITTSBURGH 22, PENNA.

HW 60-28



Kirk & Blum Clears the Air at New Neptune Foundry

The air at the Neptune Meter Co. foundry is as clean and fresh as the brand new plant itself . . . thanks to an ultra-modern dust control and ventilation system—designed, fabricated, and installed by Kirk & Blum.

The comprehensive system includes dust control, fume exhaust, and ventilation of the sand handling facilities, casting cleaning and finishing, mould dump stations and shakeouts, plus furnace and general plant ventilation.

Bag and wet type collectors remove dusty air at the rate of over 155,000 cfm. Incoming air, heated in winter, provides a continually cleaned, comfortable atmosphere in the plant.

In addition to assuring employee well-being and top production efficiency, the Kirk & Blum system meets the most rigid air pollution control requirements . . . promotes good community relations.

Place your air control problems in the hands of experts. Kirk & Blum offers one undivided responsibility—design, fabrication, installation and guaranteed performance. Write today for details and illustrated literature.

KIRK & BLUM

3108 Forrer Street • Cincinnati 9, Ohio

painted black, providing a pleasing contrast. These castings looked the part of components in a complicated engineering assembly, and could not help impress the general public as well as the individual who might be concerned with the design of machines or the selection of components.

The second display showed gray iron castings. They were exceptionally fine castings, sound with excellent surface finish. However, they were not machined, and there were no contrasting surfaces. These parts also were produced for use in complicated machines, but they failed to have the eye appeal for the general viewer that the previously described castings had been given.

When you are showing castings, any kind of castings, why not give them that little plus?

Right on Time: Editors, the business staff, and the circulation and production departments of FOUNDRY are quite proud of the record established in getting reports of the San Francisco AFS convention to you. The June issue was bound and placed in the mails on May 29, so that it reached most readers by the first of the month.

Our coverage of the meeting was so complete that the editors found it impossible to carry the complete text and at the same time provide the extensive presentation of top notch technical articles and news

reports. Therefore, the San Francisco convention story is concluded in this issue, starting on Page 149.

During the meeting, Editor Gude and I were visiting with E. Claude Jeter, general manufacturing manager of the Engine & Foundry Div., Ford Motor Co., Dearborn, Mich., when our photographer came along. The accompanying illustration resulted. F.G.S.

For More Information Circle 560, Page 39

BELT LIFE TRIPLED WITH 3M ABRASIVE

Union Brass and Metal Mfg. Co., St. Paul, Minn., switched to "Tri-M-ite" Resinbond Cloth Belts for grinding brass plumbing castings prior to plating. The results were remarkable. Belt life was boosted 3 times; a finer scratch pattern was achieved to speed final buffing and plating operations; and overall abrasive costs were reduced 10%!

COST CHECK 5-4-5

Why not let 3M's new COST CHECK 5-4-5 Program help you to effectively investigate ways to lower costs and increase profits. Discover...

- If your grinding can be done more economically
- If your finishing is as efficient as possible
- If your polishing can be done faster and better

Send today for a free COST CHECK 5-4-5 Review Form without obligation. Put 3M's years of abrasive know-how at your disposal. Write: 3M Company, 900 Bush Ave., St. Paul 6, Minn. AAD-71.

3MAGINATION in GRINDING and FINISHING

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"3M" AND "TRI-M-ITE" ARE REGISTERED TRADEMARKS OF 3M CO., ST. PAUL 6, MINN.

MINNESOTA MINING AND MANUFACTURING COMPANY

...WHERE RESEARCH IS THE KEY TO TOMORROW

3M

For More Information Circle 561, Page 39

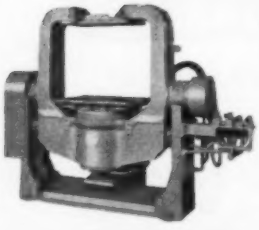
36,763*
molds
per hour?...
impossible!

THE FIGURE IS RIGHT...

AND ACTUALLY QUITE CONSERVATIVE!

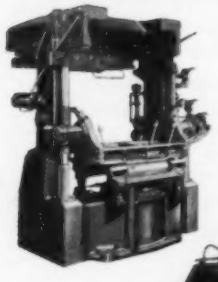
The identification trade mark of SPO states that this organization is the "World's largest supplier of mold-machines." This is not just another advertising claim. There are SPO machines operating all over our globe . . . in almost every country. At this moment, men of every race, creed and color . . . and speaking virtually every language and dialect in the world . . . are producing molds on machines bearing the name SPO. It is our conservative estimate that MORE than 36,763 molds will be produced in THIS hour.

Our leadership has been earned . . . earned through long years of devotion to the industry and applied skill within individual professions comprising the entire field of metals. In foundry molding systems, our technological advances resulting from creative engineering, have established new horizons of molding progress.

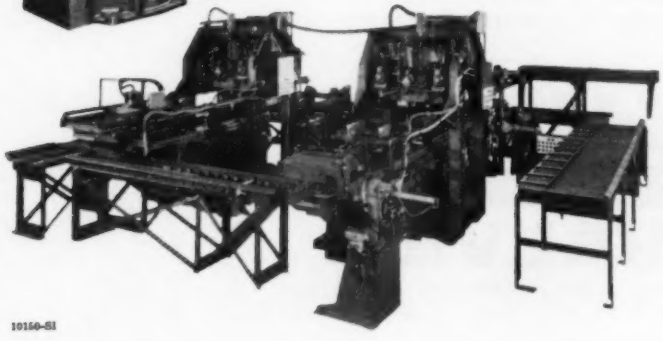


SPO leadership will not go unchallenged . . . however . . . we propose to continue our dedication to progress. We will continue to improve our creative engineering services so that we can continue to supply versatile, efficient, economical "packaged" systems to meet every molding requirement, including Turnkey facilities.

THERE'S A SPO MACHINE FOR EVERY MOLDING JOB



In an industry as specialized as the foundry, leadership cannot be assumed . . . it must be earned through capability and accomplishment.



WORLD'S LARGEST SUPPLIERS SPO OF MOLDING MACHINES

SPO INCORPORATED

6449 Grand Division Ave.,
Cleveland 25, Ohio

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For More Information Circle 562, Page 39

BIG CONTROL VALVES

up to 8 in. • 5000 psi

2 in., 3-way 3-position, double solenoid type.

8 in., 2-way 2-position, double pilot cylinder type.

Need more flow capacity than you can get with the largest sizes available in most valve lines? There's an easier answer than resorting to costly multiple valving, or redesigning your system to suit flow limitations.

Hunt builds valves in sizes up to 8 in., with air flow ratings of *more than 32,000 cfm @* 100 psi pressure drop! In fact, you can choose from valves ranging in size from ⅛ through 8 in.; 2 and 3-way, 4-way 2 or 3-position; solenoid, remote-pilot or mechanically actuated; with a variety of optional mountings and features.

If control of large volumes of air, oil, water, or soluble oil and water at pressures up to 5000 psi hyd. is one of your requirements, it'll pay you to talk to your Hunt representative. His specialized knowledge can save you hours and dollars. Call him today.

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QUICK-AS-WINK© AIR AND HYDRAULIC

VALVES

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For more information, write for Bulletin 603. Address Hunt Valve Company, Salem, Ohio, Dept. FO-761.

3020

LATE NEWS

MARCHING AHEAD: Department of Commerce figures on castings shipments confirm that March was the month in which the decline in castings production that started last July came to an end. These figures show the following upturns compared with February: Gray iron, up 21 per cent; steel, up 15.7 per cent; malleable iron, up 15 per cent; copper-base alloys, up 14 per cent; magnesium-base alloys, up 11 per cent; zinc-base alloys, up 10.4 per cent; and aluminum-base alloys, up 9 per cent.

GRAY IRON SURVEY: Results of a survey made by the Gray Iron Founders' Society early in June indicate that the March increases were not one-time flukes. Nearly 200 foundries producing miscellaneous gray and ductile iron castings reported operations at 71 per cent of "ideal" in May. Since substantially the same group reported operations at 60 per cent in March and April, May should show a considerable rise in tonnage. In addition, all but about 15 per cent of foundrymen surveyed felt that June shipments would be as good as those in May or better.

BALANCE OF '61: Business will continue to improve throughout the balance of 1961, although it will not reach boom proportions, according to the National Association of Purchasing Agents. A strong 87 per cent of reporting members of the group's Business Survey Committee anticipate a better second half, with the present upward trend being sustained for the rest of the year. They also report that "close-to-the-belt" buying can be expected

Foundry Statistics

Iron and Steel Scrap Consumption

(Gross tons*)

	All Scrap Total	By Types of Furnace — Cupola Total	Air Total	Electric Total
1959	58,979,881	9,613,059	1,156,097	9,232,037
1960				
Feb.	6,478,564	822,476	97,688	1,013,388
2 mo.	13,506,176	1,645,918	193,130	2,071,547
Mar.	6,855,569	839,016	106,749	974,535
Apr.	5,625,717	754,486	82,767	787,186
May	5,051,121	771,800	79,170	652,585
June	4,485,444	809,297	87,485	633,797
July	3,673,127	603,062	55,974	520,361
Aug.	4,217,562	692,470	78,788	697,243
Sept.	4,148,550	732,252	76,939	641,712
Oct.	4,375,871	742,039	71,862	675,356
Nov.	3,939,970	709,187	70,282	607,471
Dec.	3,738,385	669,256	66,438	601,274
Total	59,422,492	8,968,777	989,584	8,853,067
1961				
Jan.	4,059,361	654,353	65,434	646,999
Feb.	3,925,802	593,810	61,286	642,853
2 mo.	7,985,163	1,248,163	126,720	1,289,852

Index of Foundry Equipment Orders

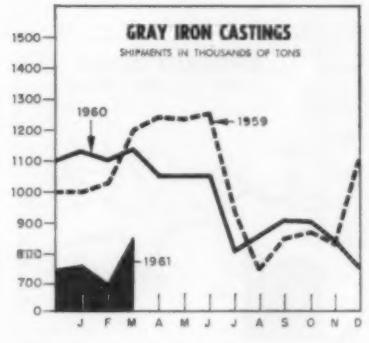
Foundry Trades Only

(Net Orders Closed, New Equipment)

	1960	1961
Jan.	95.5	123.7
Feb.	128.6	81.8
Mar.	159.9	99.1
Apr.	97.9	115.2
May	159.0	....
June	164.8	....
July	80.0	....
Aug.	92.4	....
Sept.	158.1	....
Oct.	81.7	....
Nov.	106.5	....
Dec.	101.2	....

Note: Base period 1947-49 taken as 100 per cent monthly average.

Source: Foundry Equipment Manufacturers Association.



GRAY IRON CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings — Total	All Castings — For Sale	Miscellaneous Total	Castings For Sale	Nodular Iron Castings Total	Heavy Steel Ingot Molds Total	Chilled Railroad Car Wheels Total	Pressure Pipe & Fittings Total[2]	Soil Pipe & Fittings Total[2]	Unfilled Orders[3]
1959	12,307,798	6,994,200	7,451,925	3,247,399	173,433	2,142,498	309,945	1,440,883	562,547	.....
1960										
Mar.	1,143,685	600,448	685,392	284,493	15,966	294,322	24,409	83,121	56,441	881,877
3 mo.	3,387,400	1,763,811	2,042,130	841,199	49,395	875,054	60,720	246,251	163,245	.....
Apr.	1,051,700	580,931	609,577	259,335	13,980	232,895	21,737	118,886	68,605	834,495
May	1,052,798	588,770	613,745	257,180	13,126	267,094	20,414	136,455	75,090	781,596
June	1,049,638	601,597	622,236	273,148	15,010	183,040	19,810	144,773	79,770	719,564
July	803,306	450,580	478,269	202,347	10,694	120,784	16,226	120,652	67,375	754,789
Aug.	858,503	546,395	490,059	238,561	15,675	131,428	14,221	139,275	83,520	712,784
Sept.	900,497	527,227	554,788	245,887	14,616	125,688	13,460	135,327	71,234	695,325
Oct.	905,139	509,054	568,869	238,249	12,859	139,977	12,559	117,009	66,725	646,852
Nov.	835,709	454,611	538,817	230,022	11,870	123,054	12,410	102,959	58,469	568,974
Dec.	748,821	394,981	506,979	219,525	12,097	107,559	12,306	73,959	48,018	552,813
Totals	11,593,511	6,402,957	7,025,469	3,055,453	169,853[4]	2,246,582	203,863	1,335,546	782,061	.....
1961										
Jan.	760,136	406,315	504,182	222,508	11,874	123,277	11,847	69,881	50,949	599,776
Feb.	702,413	378,252	465,654	209,207	11,184	116,563	7,403	66,541	46,252	620,623
Mar.	856,491	456,928	509,932	233,354	12,193	155,545	9,090	110,792	71,132	651,696
3 mo.	2,319,040	1,281,495	1,279,768	664,099	35,251	395,385	28,340	247,214	168,333	.....

Source: U. S. Dept. of Interior, Bureau of Mines. [2]Source: Bureau of the Census. [3]For sale only. [4]All cast iron pipe is shipped for sale. [5]Gray iron total includes nodular iron. [6]Monthly figures do not add up to total shown because of unreported monthly revisions.

Late News

to continue. Delivery or lead-time will be the determining factor in forward commitments.

EQUIPMENT UP: Responding to the improved level of castings production, foundrymen apparently are buying more equipment to help them compete as the demand rises. In April, the index of the Foundry Equipment Manufacturers Association hit 115.2, or 16 per cent better than the March figure and the third highest since last June. In February the index stood at only 81.8.

STEEL CAR WHEELS: American Brake Shoe Co., New York, is spending $2 million to convert its cast iron freight car wheel plant at St. Louis to the manufacture of cast steel wheels. New electric furnaces, heat treating, and machining facilities will be added at the St. Louis plant. Brake Shoe also is spending $1 million to expand its cast steel wheel plant at Calera, Ala., which it has operated since 1954.

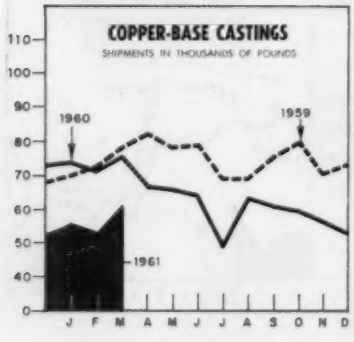
The company operates other cast iron wheel plants at Toledo, Ohio, and Portsmouth, Va., and these are being considered for conversion to cast steel wheel production at a later date.

MORROGH AT GIFS: Gray Iron Founders' Society has announced that H. Morrogh, director, British Iron Research Association, Birmingham, will be guest speaker at the annual meeting in Toronto, Oct. 18-20.

NEW WHEEL PLANT: Sixth steel wheel plant of Griffin Wheel Co., subsidiary of American Steel Foundries, now under construction at Bensenville, Ill., will be completed in August. Plant will have floor area of 135,000 sq ft, employ about 135, and have a capacity of about 48,000 wheels per year. The Griffin process of forcing molten metal into graphite molds with air pressure will be used.

EAST COAST REGIONAL: Theme of the 1961 East Coast Regional Conference will be "New Frontiers in Metal Castings." The meeting will be held at the Statler-Hilton Hotel, New York, Sept. 22-23, and 30 speakers will present papers pointing up recent technical advances and opportunities involving cast metals. Morning and afternoon technical sessions are scheduled for the first day, Friday, and a morning session on Saturday.

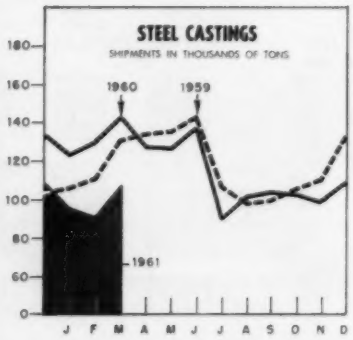
Foundry Statistics



COPPER-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments			
	Total	Sand	Perm. Mold	Unfilled Orders[2]
1959	871,032	765,246	52,456	.....
1960				
Mar.	75,908	66,517	4,346	27,470
3 mo.	221,676	195,362	12,407	.....
Apr.	66,777	58,453	4,523	27,422
May	66,299	57,848	4,463	24,582
June	64,585	56,441	3,715	21,781
July	48,399	42,778	2,910	22,367
Aug.	63,765	56,344	3,669	21,915
Sept.	61,362	54,104	3,699	21,063
Oct.	59,877	52,734	3,556	22,006
Nov.	56,358	50,043	3,132	21,261
Dec.	53,009	46,237	3,369	21,914
Total	762,107	670,344	45,443	.....
1961				
Jan.	55,878	48,928	3,286	22,792
Feb.	53,457	47,156	2,615	22,065
Mar.	61,252	53,277	3,414	20,965
3 mo.	170,587	149,361	9,315	.....



STEEL CASTINGS—SHIPMENTS

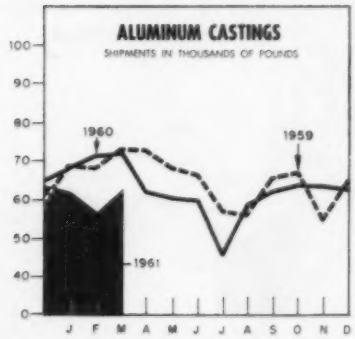
(Net tons[1])

	All Castings			Carbon			Alloy			
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Unfilled Orders[2]
1959	1,412,885	1,112,668	210,984	1,043,538	814,219	194,201	369,347	298,449	16,783	.....
1960										
Mar.	143,708	109,688	25,702	104,742	78,755	24,266	38,966	30,933	1,436	277,982
3 mo.	395,532	301,667	68,266	294,827	222,533	64,501	100,705	79,134	3,765	.....
Apr.	127,219	96,577	22,828	93,433	70,251	21,253	33,786	26,326	1,575	248,902
May	128,580	97,231	23,890	93,700	71,808	22,421	32,880	25,423	1,469	252,293
June	136,922	107,076	26,389	101,294	78,601	24,707	35,628	28,475	1,682	233,795
July	89,565	67,294	13,430	63,753	47,570	12,804	25,812	19,724	626	223,880
Aug.	101,709	77,146	14,619	73,338	55,099	13,713	28,371	22,047	906	213,611
Sept.	104,298	79,556	14,171	74,447	56,128	13,273	29,851	23,430	898	199,413
Oct.	102,664	79,622	14,586	72,544	57,879	13,544	30,120	21,743	1,042	186,311
Nov.	99,577	78,305	15,768	69,927	56,466	14,113	29,650	21,839	1,655	174,317
Dec.	108,249	87,417	24,849	78,805	64,997	22,295	29,444	22,420	2,554	162,882
Total	1,392,385	1,071,871	238,796	1,016,068	781,330	222,624	376,317	290,541	16,172	.....
1961										
Jan.	96,190	76,650	11,534	68,795	56,592	10,550	27,395	20,058	984	156,683
Feb.	92,602	71,907	9,128	64,849	51,209	7,818	27,753	20,698	1,310	145,024
Mar.	107,275	82,522	11,342	75,728	59,239	10,068	31,547	23,283	1,274	143,589
3 mo.	296,067	231,079	32,004	209,372	167,040	28,436	86,695	64,039	3,568	.....

[1]Source: Bureau of the Census. [2]For sale only.

PERSONALS: Melvin D. Gerald has been appointed manager, Foundry Div., Benthall Machine Co., Suffolk, Va. He formerly was with Carolina Foundry, Spartanburg, S. C. . . . Warren N. Pollock has joined Clearfield Machine Co., Clearfield, Pa., as general sales manager . . . F. Kenneth Iverson has been named executive vice president, Coast Metals Inc., Little Ferry, N. J. . . . A. J. Fehr has been appointed Cleveland sales manager, Farrell-Cheek Steel Co., Sandusky, Ohio . . . Charles D. Chamberlin has been appointed district manager for Newaygo Engineering Co., Newaygo, Mich., in the central region . . . Clifford Amend has been named metallurgist for Ajax Magnethermic Corp., Youngstown, Ohio . . . Charles A. Stone has been appointed marketing manager, Stewart Die Casting Div., Stewart-Warner Corp., Chicago . . . Stuart D. Walker has been named district manager, Hevi-Duty Electric Co., a division of Basic Products Corp., Watertown, Wis., to serve the New England states . . . Thomas A. Claiborne has been appointed general sales manager, Alloy & Metals Div., Tennessee Products & Chemical Corp., Nashville, Tenn. James C. Holway has been named manager of the company's Detroit sales district . . . Norman A. Greig now is general manager, Centre Foundry & Machine Co., Wheeling, W. Va.

MISCELLANY: Hydraulic Press Mfg. Co., Mt. Gilead, Ohio, acquired by Koehring Co., Milwaukee, in 1956, has changed its name to H-P-M Div., Koehring Co. . . . G. E. Smith Inc., Pittsburgh, has established an Industrial Div. to manufacture and distribute a line of products which supplements the firm's products for the foundry industry. Smith also has signed a licensing agreement with Gebr. Huttens KF, Dusseldorf, Germany, which permits the German firm to make Smith's binders in Germany . . . Chemical Products Corp., Cartersville, Ga., has begun construction of a new plant there for the manufacture of sodium silicates . . . Industrial Heating Equipment Association reports that total net orders for industrial heating equipment during the first four months of 1961 were off 32 per cent from those in the same period last year . . . Pyronics Inc. is the new name of the former Bryant Industrial Products Corp., Cleveland . . . Primary aluminum production during the first five months of 1961 totaled 754,190 tons.



PRODUCTION WORKERS

Estimated Number

	Mar. 1961	Feb. 1961	Mar. 1960
Ferrous	167,400	168,800	194,700
Nonferrous	44,000	44,700	53,700

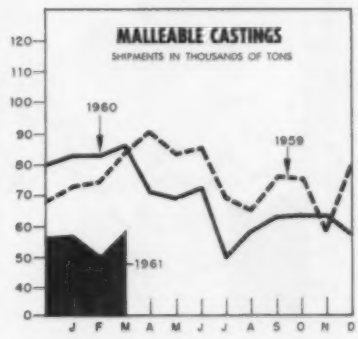
Average Weekly Earnings

Gray Iron	92.50	90.65	97.96
Malleable Iron	92.58	91.26	96.65
Steel	101.23	101.38	102.56
Nonferrous	102.00	103.17	100.60

Average Weekly Hours

Gray Iron	37.6	37.0	39.5
Malleable Iron	37.3	36.8	39.7
Steel	38.2	38.4	39.6
Nonferrous	40.0	40.3	40.4

Source: Bureau of Labor Statistics.



ALUMINUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments Total	Sand	Perm. Mold	Die	Unfilled Orders[2]
1959	786,399	141,987	274,855	368,101	.....
1960					
Mar.	72,216	12,934	22,413	36,749	78,024
3 mo.	212,162	36,912	68,395	107,440	.....
Apr.	61,797	12,339	19,950	29,400	75,243
May	60,330	10,682	21,507	28,055	75,977
June	60,068	11,280	20,953	27,722	74,699
July	45,694	8,765	15,804	20,973	76,434
Aug.	58,848	10,639	18,901	29,256	75,230
Sept.	62,116	10,514	22,031	29,527	75,144
Oct.	63,750	10,149	23,339	30,213	71,364
Nov.	63,408	9,901	23,612	29,831	73,032
Dec.	63,629	9,578	23,272	30,677	71,398
Total	751,802	129,859	257,764	363,094	.....
1961					
Jan.	60,774	10,210	21,821	29,904	63,729
Feb.	57,144	10,183	19,518	27,355	62,748
Mar.	62,324	10,604	21,454	30,246	62,553
3 mo.	180,242	30,997	62,793	87,505	.....

[1]Source: Bureau of the Census. [2]For sale only.

MALLEABLE IRON CASTINGS

(Shipments of castings—net tons[1])

	Shipments Total	Shipments For Sale	Standard Total	Standard For Sale	Pearlitic Total	Pearlitic For Sale	Unfilled Orders[2]
1959	916,362	557,303	729,868	449,946	186,494	107,357	.....
1960							
Mar.	86,243	49,907	67,448	40,422	18,795	9,485	84,670
3 mo.	252,549	142,911	195,216	113,746	57,333	29,165	.....
Apr.	71,271	39,059	56,136	32,066	15,135	6,993	79,237
May	68,942	37,618	53,106	30,126	15,834	7,492	73,240
June	72,593	43,105	55,956	34,526	16,637	8,579	63,920
July	49,860	28,575	37,187	22,477	12,673	6,098	74,329
Aug.	58,785	36,765	46,522	29,077	12,263	7,688	69,853
Sept.	63,048	36,114	48,635	28,623	14,413	7,491	69,033
Oct.	63,521	35,492	47,932	27,813	15,589	7,679	56,616
Nov.	62,978	35,432	47,571	27,611	15,407	7,821	55,627
Dec.	57,154	31,500	43,319	24,729	13,835	6,771	54,657
Totals	820,701	466,571	631,582	370,794	189,119	95,777	.....
1961							
Jan.	57,697	34,064	43,778	27,104	13,919	6,960	52,171
Feb.	50,828	29,875	39,358	23,854	11,470	5,821	47,703
Mar.	58,464	33,531	45,747	26,711	12,717	6,520	45,477
3 mo.	166,989	97,270	128,883	77,669	38,106	19,601	.....

Prices of Foundry Metals and Coke

(As of June 23, 1961)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE

Connellsville	$18.00-$18.50

OVENS

Birmingham	$30.35
Buffalo	32.00
Detroit	32.00
Erie, Pa.	32.00
Indianapolis	31.25
Kearny, N. J.	31.25
Milwaukee	32.00
Neville Island (Pittsburgh)	30.75
New Haven, Conn.	31.00
Painesville, O.	32.00
Philadelphia	31.00
St. Louis	33.00
St. Paul	31.25
Swedeland, Pa.	31.00
Terre Haute, Ind.	31.25

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Boston, deld.	77.79	78.29
Buffalo	66.50	67.00
Chester, Pa.	Nom.	Nom.
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 32.00; tin bronze, No. 225, 41.25; No. 245, 35.75; high-leaded tin bronze, No. 305, 36.00; No. 1 yellow, No. 405, 27.50; manganese bronze, No. 421, 31.25.

ALUMINUM: Primary alloy No. 13, 25.90; No. 43, 26.20; No. 195, 27.60; No. 214, 29.00; No. 356, 26.80; Secondary No. 12 alloy, 21.75-22.25. Deoxidizing grades: No. 1, 23.25; No. 4, 20.00.

MAGNESIUM ALLOY: AZ91A, 40.75; AZ63A, AZ92A, AZ91C, 40.75, f.o.b. Velasco, Tex.

COPPER: Electrolytic 31.00, delivered Connecticut valley.

ZINC: High grade, 12.35, delivered. Die casting alloy No. 3, 13.75; No. 2, 14.25, delivered.

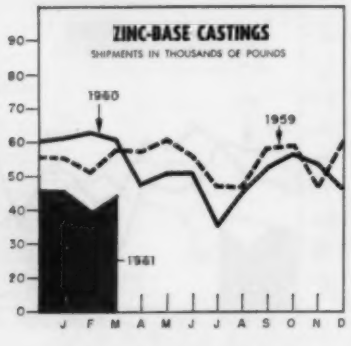
Iron and Steel Scrap

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Machinery, Cast	Structurals, Plates	Malleable	Short Steel Rails
Birmingham	$35.00-36.00	$42.00-43.00	.....	.....	$42.00-43.00	.....	$46.00-47.00
Boston*	**28.50-29.00	**39.00-40.00	.....	**40.00-42.00	.....	.....	.....
Buffalo	31.00-32.00	**38.00-39.00	.....	.....	39.00-40.00	.....	48.00-49.00
Chicago	38.00-39.00	42.00-43.00	.....	47.00-48.00	42.00-43.00	47.00-48.00	49.00-51.00
Cincinnati*	**32.00-33.00	**34.00-35.00	**28.00-29.00	**46.00-47.00	.....	.....	**47.00-48.00
Cleveland	35.00-36.00	39.00-40.00	28.00-29.00	48.00-49.00	39.00-40.00	47.00-48.00	48.00-50.00
Detroit*	32.00-33.00	32.00-33.00	26.00-27.00	.....	.....	.....	.....
Los Angeles	38.00-40.00	44.00-47.00	.....	.....	50.00-52.00	.....	.....
New York*	30.00-31.00	34.00-35.00	31.00-32.00	.....	32.00-33.00	.....	.....
Philadelphia	39.00-40.00	40.00	40.00	49.00-50.00	43.00-44.00	49.00	52.00-54.00
Pittsburgh	36.00-37.00	34.00-35.00	.....	46.00-46.00	41.00-42.00	.....	50.00-52.00
St. Louis*	34.00	37.00	32.00	.....	.....	.....	43.00
San Francisco	44.00	46.00	28.00	45.00-46.00	.....	.....	.....
Seattle	44.00-45.00	42.00	39.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point.

Foundry Statistics



ZINC-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1959	631,210	443,009	.....
1960			
Mar.	65,816	39,618	60,267
3 mo.	195,338	121,484	.....
Apr.	47,563	31,423	56,312
May	50,844	33,551	56,654
June	50,809	34,264	51,960
July	35,117	25,186	52,392
Aug.	45,101	32,549	57,551
Sept.	52,514	34,451	57,480
Oct.	56,205	36,459	57,028
Nov.	53,574	33,758	55,306
Dec.	46,208	29,341	51,516
Totals	623,203	412,466	.....
1961			
Jan.	46,011	30,311	50,940
Feb.	30,946	26,715	45,453
Mar.	44,130	29,724	43,921
3 mo.	130,087	86,750	.....

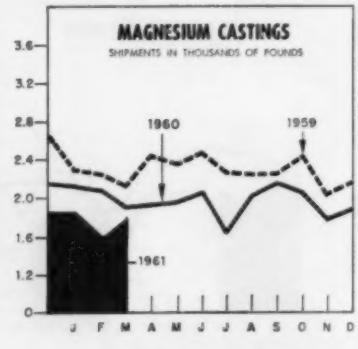
PIG IRON

PRODUCTION*—Net Tons

	Foundry	Malleable & Silvery	Low & Int. Low Phos. & Bessemer
1959	1,689,445	2,816,359	3,471,683
1960			
Apr.	134,509	258,452	395,575
4 mo.	537,336	1,255,651	1,793,211
May	135,825	290,057	356,931
June	105,717	247,991	309,942
July	117,218	166,084	290,384
Aug.	78,950	171,718	211,506
Sept.	93,260	202,895	152,880
Oct.	133,525	183,639	208,758
Nov.	122,550	231,203	206,062
Dec.	130,455	153,009	202,353
Totals	1,454,836	2,902,247	3,732,027
1961			
Jan.	106,054	165,571	170,224
Feb.	98,297	144,476	214,396
Mar.	101,306	159,529	222,688
Apr.	114,050	150,322	189,779
4 mo.[3]	421,153	619,898	797,087

CONSUMPTION*—Gross Tons

	Cupola	Air	Electric
1959	3,989,129	223,868	351,355
1960			
Mar.	317,526	21,042	43,959
3 mo.	966,822	58,933	132,778
Apr.	282,178	16,796	36,971
May	292,407	15,730	19,869
June	313,340	16,828	23,720
July	241,752	11,892	21,123
Aug.	273,722	14,697	27,919
Sept.	284,809	13,548	19,962
Oct.	269,103	13,631	13,947
Nov.	254,799	12,867	17,567
Dec.	233,592	12,722	18,344
Totals	3,412,524	187,644	331,200
1961			
Jan.	232,051	13,293	16,375
Feb.	225,222	12,195	21,705
Mar.	251,524	13,922	18,646
3 mo.	708,797	39,410	56,726



MAGNESIUM CASTINGS

(Shipments of castings—1000 pounds[1])

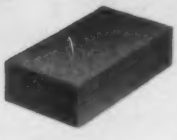
	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1959	27,253	23,109	.....
1960			
Mar.	1,903	1,524	3,208
3 mo.	6,113	4,791	.....
Apr.	1,926	1,533	3,138
May	1,953	1,514	2,948
June	2,050	1,555	3,396
July	1,638	1,234	3,541
Aug.	2,025	1,530	3,364
Sept.	2,146	1,653	3,271
Oct.	2,038	1,519	3,274
Nov.	1,776	1,269	3,433
Dec.	1,875	1,345	3,156
Total	23,540	17,943	.....
1961			
Jan.	1,862	1,436	2,847
Feb.	1,610	1,206	2,770
Mar.	1,791	1,360	2,476
3 mo.	5,263	4,002	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For Sale only. [3]Monthly figures do not add up to totals shown because of unreported monthly revisions.

Something New ON THE FOUNDRY HORIZON...

and that SOMETHING is

FERRINOX 85 *Briquettes*



HIGH POTENCY SILICON CARBIDE

For many years progressive foundrymen have introduced silicon carbide into their gray iron melts as a means for producing better castings and the convenient unitized form of FERRINOX 65 *Briquettes* has long been recognized as the most dependable and satisfactory method of introduction.

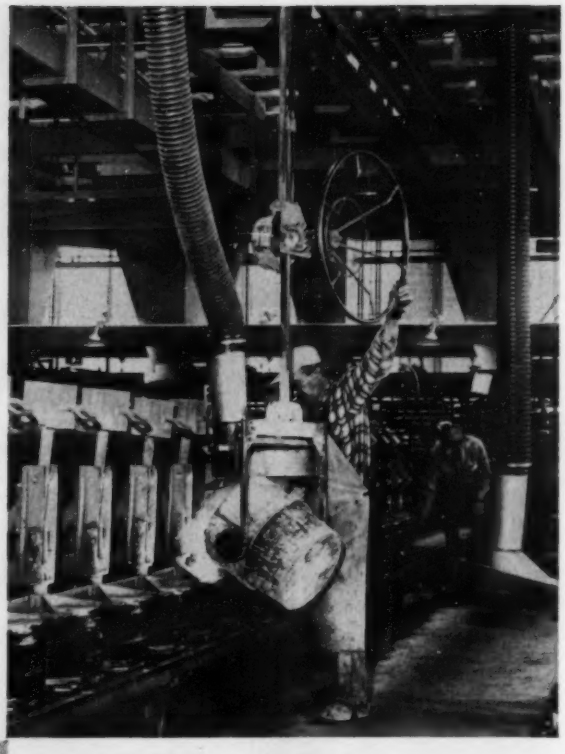
Today the Merit Corporation announces the development of a new and more powerful briquette, High Potency FERRINOX 85, formulated to contain *over 30%* more silicon carbide (and silicon) than regular FERRINOX and other 65% briquettes. Virtually "loaded" with high-test, high potency silicon carbide, the very finest produced for metallurgical use, High Potency FERRINOX 85 provides, to an even greater degree, all of the many benefits obtained through the use of regular FERRINOX.

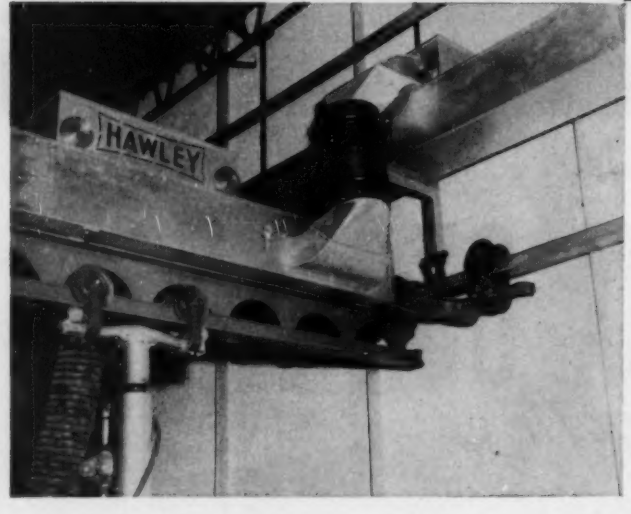
Along with its companion product, FERRINOX 65, the performance of this new High Potency Briquette is unexcelled as a deoxidizing agent and, in addition, its use promotes greater silicon recovery, increases fluidity and, through generally improved microstructure of the iron, aids in the production of stronger, denser and more uniform castings with better machining properties. Because of FERRINOX 85's much higher silicon carbide content, fewer briquettes are required to produce the same effect, resulting in worthwhile savings in handling, storage and freight. *For more complete information on* FERRINOX 85 *call or write today.*

Both FERRINOX 85 and FERRINOX 65 are products of the Merit Corporation · Milwaukee, Wisconsin

DISTRIBUTED BY FOREMOST FOUNDRY SUPPLY COMPANY • MILWAUKEE • CHICAGO • DETROIT • CLEVELAND

Neptune Meter drastically reduces cost of ventilation . . . installs new mobile fume exhaust system for best air pollution control





HAWLEY

Trav-L-Vent

Pat. No. 2923227

. . . the only completely mobile ventilator . . . eliminates costly area-type systems . . . exhausts hazardous fumes and dust at source!

Trying to ventilate a brass pouring operation any other way would have been outlandishly expensive—and not nearly as efficient—for Neptune Meter Company's new foundry at Long Island, New York.

Look what your foundry can gain by wisely installing HAWLEY *Trav-L-Vent.*

1. Trap and eliminate hazardous fumes at source.
2. Prevent employee illness from breathing unhealthful fumes.
3. Save waste of heat in winter • obtain continuous, healthful, controlled ventilation winter and summer.
4. End worker discomfort—no more "zinc shakes" or "brass chills."
5. Gain increased production from better winter working conditions • decrease downtime due to absenteeism.
6. Improve worker morale . . . reduce any excessive employee turnover.
7. System travels to any point in pouring bay . . . with 360° pivot to facilitate pouring.

Call HAWLEY to see how *Trav-L-Vent* fits every foundry design . . . makes possible completely unlimited travel of pouring devices and plant layout. Find out how this inexpensive, new, mobile system *saves you money* while keeping your plant free of obnoxious and hazardous fume conditions.

HAWLEY MANUFACTURING COMPANY • 776 North Manchester Avenue • Wabash, Indiana

Full-Size 1961 Autos Use More Zinc Than 1960 Equivalents

Use of zinc diecastings on 1961 full-size automobiles is up some 15 per cent over amounts used on comparable 1960 models. The American Zinc Institute reports that an average of 86.5 lb of zinc diecastings is used on 1961 cars, whereas the 1960 figure was 72 lb.

Increases in use of zinc diecastings are reported to be prominent in such high-production models as the Chevrolet Impala, Buick, Oldsmobile, and Chrysler Imperial. Use of zinc diecastings on this year's Imperial rose about 80 lb over 1960 to 172 lb, making this car the leading zinc consumer. Uses for zinc diecastings on this car include grille components, headlight housings, rear window frames, an instrument cluster, and eight side moldings.

A 17 per cent increase in automotive use of zinc diecastings during the 1960s was predicted by E. C. Quinn, vice president, Chrysler Corp., in speaking before the American Zinc Institute's recent annual meeting in Chicago.

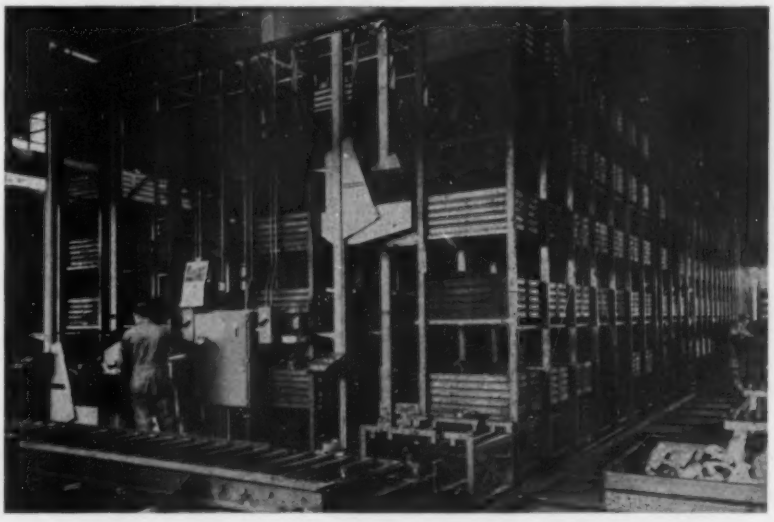
This prediction is based on expected annual new car sales of 7 million by 1965 and as many as 8 million by 1970.

Woodward Iron Co. To Acquire Assets of Lynchburg Foundry

Lynchburg Foundry Co., Lynchburg, Va., will be acquired by Woodward Iron Co., Woodward, Ala., if stockholders approve an agreement by directors of the two companies covering the sale.

Henry E. McWane, president of Lynchburg, and W. R. Bond, president of Woodward Iron, announced jointly that assets of Lynchburg Foundry would be acquired in exchange for Woodward Iron common stock.

Woodward Iron Co. is a major southern producer of merchant pig iron and manufacturer of cast iron soil, pressure pipe, and fittings. Lynchburg Foundry makes cast iron pipe and gray and ductile iron castings.

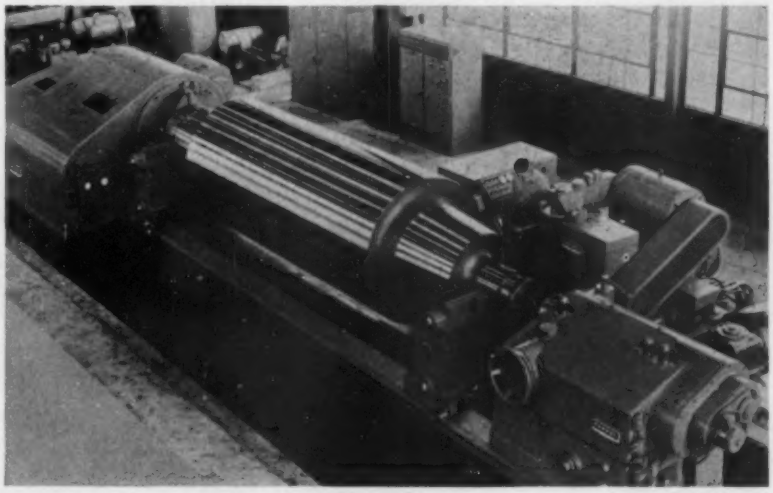


Automatic Unit Stores Castings

● SAVINGS of $10 a ton of malleable castings has been the result of installing a conveyorized storage and handling facility in the finishing room at Marion Malleable Iron Works, Marion, Ind. Company officials estimate that a new system saves 800 manhours a week in sorting and storing castings and takes only half the floor space required by the former method.

The installation consists of two 90-ft aisles, lined on each side with five layers of storage bins. Altogether, there are 520 bins, serviced by two elevator units, one in each aisle. Castings in steel boxes are

(*Concluded on Page* 26)



RECORD ROLL: According to United Engineering & Foundry Co., this cast steel roll is the largest ever produced and is being handled by the largest roll grinder in the United States at its Vandergrift, Pa., plant. The roll is 72 in. in diam, its body is 14 ft 2 in. long, and its over-all length is 24 ft 9 in. When finished, it will weigh 238,000 lb. The grinder was built for United Engineering by Farrel-Birmingham Co., Ansonia, Conn.

Mechanized, High Quality Production with the HERMAN Stationmasters

These versatile Herman Stationmaster Machines are being used in a leading cast enamelware plant for high quality, low cost production of bath tubs.

The requirements of *accurate mold cavity*, to produce a section thickness of only ¼ inch; *uniformity*, to eliminate warping when the tub is heated for enameling; and the *specially-shaped flasks*, to incorporate an apron for the tub . . . are all met successfully through the use of these molding machines.

The Stationmaster, an automatic two-station indexing unit, mass-produces these tubs with uniformly high quality at a rate of 60 or more molds per hour with a crew of only 9 men. It has been achieving this trouble-free production day in and day out, for an extended period of time.

If you are looking for high-speed, flexibility, efficiency and *reduced costs*, by re-evaluation of your molding line, it will pay you to check into the Herman Stationmaster.

They are performing equally well in a wide variety of American installations having specific production requirements . . . as well as in England, Australia, Switzerland, France, Germany, Spain and other countries.

It might well be *your* answer to the common problem of reduced costs and improved production.

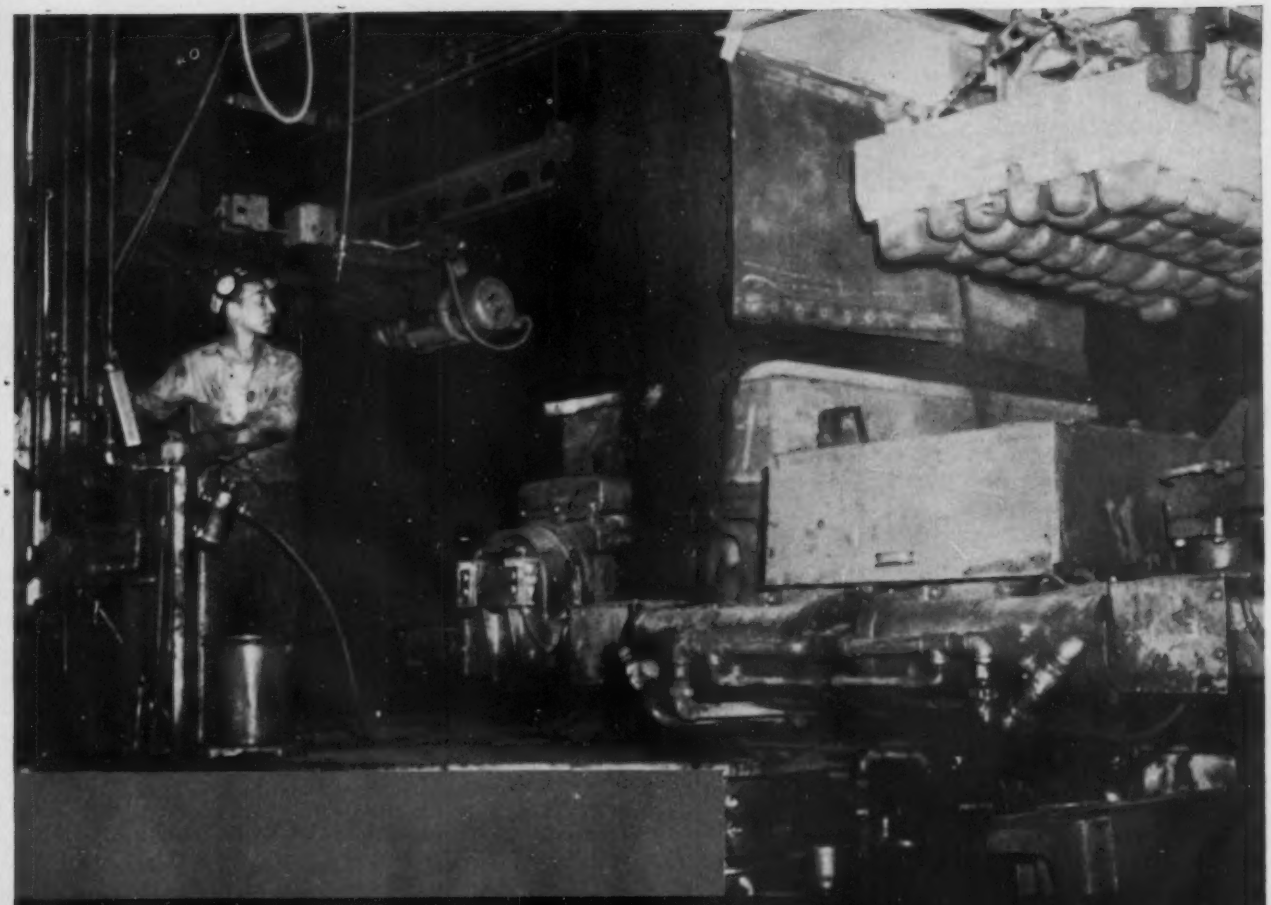
Why not look into this *today*?

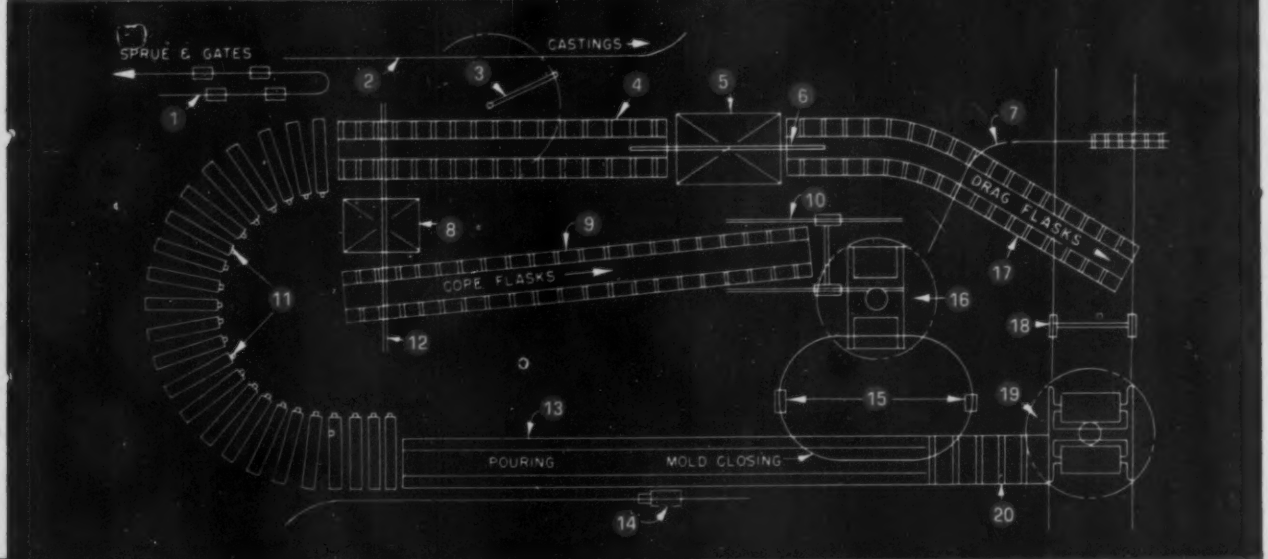
* "CUTTING COSTS" BY HERMAN

NUMBER FOUR OF A SERIES

HERMAN PNEUMATIC MACHINE CO.
UNION BANK BUILDING,
PITTSBURGH 22, PA.

Best Known and Most Progressive Name in Engineered Molding Machines.





1. Sprue conveyor
2. Cooling conveyor
3. Jib crane
4. Gravity roll conveyor
5. Drag shakeout
6. Monorail hoist
7. Pattern monorail
8. Cope shakeout
9. Gravity roll conveyor
10. Crane
11. Powered roll conveyor
12. Monorail hoist
13. Walking beam conveyor
14. Pouring ladle
15. Mold closing hoists
16. Cope molding machine
17. Gravity roll conveyor
18. Crane
19. Drag molding machine
20. Powered roll conveyor

For More Information Circle 566, Page 39

(*Concluded from p. 23*)
moved via a conveyor from the heat treat ovens to a dolly at the head of either aisle. The proper elevator picks up a box and moves down the aisle to the proper row of bins. It then elevates the box of castings and moves it into the bin where the castings are to be stored. Retrieval of the castings is exactly the opposite procedure.

With this arrangement, maximum cycle time for the farthest bins is 4 minutes, with a 1-minute minimum for the front bins. About 1000 lb of castings are loaded into each container, and about 50 tons are moved in or out of storage during an average shift. Control consoles for the system are single command units for either placing a load into storage or taking one out without the operator's leaving his position at the head of the aisles.

The boxes are 30 in. wide, 42 in. long, and 15 in. high and fit easily into the bin openings, which are 31 in. wide, 45 in. long, and 33 in. high. They rest directly on load support channels in the structure. Floor space occupied by the system is approximately 2160 sq ft.

Castings were stored in wheeled trucks under the old system, and hunting for the proper castings took much time. Now, it is possible to store partially finished castings and make quick deliveries without maintaining a large supply of finished parts in storage. The cost of the system was approximately $50,000, and it has been in service somewhat less than a year. It was installed by Triax Co., Cleveland.

Reynolds Appoints Distributor

Reynolds Metals Co., Richmond, Va., has appointed Foundries Materials Co., Coldwater and Detroit, Mich., to distribute Reynolds aluminum pig and ingot in the Great Lakes area. Douglas Strong, president, Foundries Materials Co., also is president of Warner R. Thompson Co., Detroit.

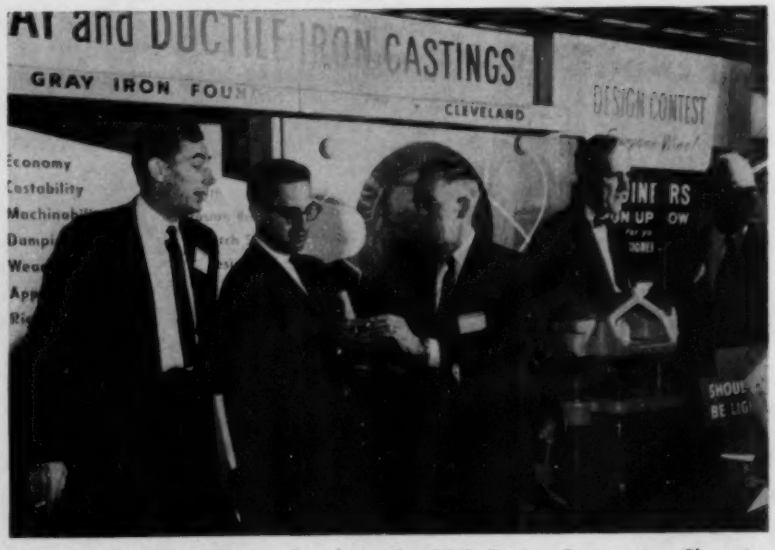
Groups Exhibit at Design Show

Several visitors are shown inspecting the Malleable Castings Council booth at the Design Show. Cutout shows typical automotive malleable castings

● ADVANTAGES of gray and malleable iron and high alloy castings were displayed at the Design Engineering Show, held recently in Cobo Hall, Detroit. The Gray Iron Founders' Society, the Malleable Castings Council, and the Alloy Casting Institute sponsored exhibits representing their respective industries.

Focal point of the Malleable exhibit was a life-sized cutout of an automobile with an array of mal-

(*Concluded on Page 29*)



Gray Iron Founders' Society booth at the 1961 Design Engineering Show included a compression tester to show the high compressive strength of gray iron.

Circle 567, Page 39→

Restore Costly Copper Components to Full Efficiency

AT A FRACTION OF REPLACEMENT COST!

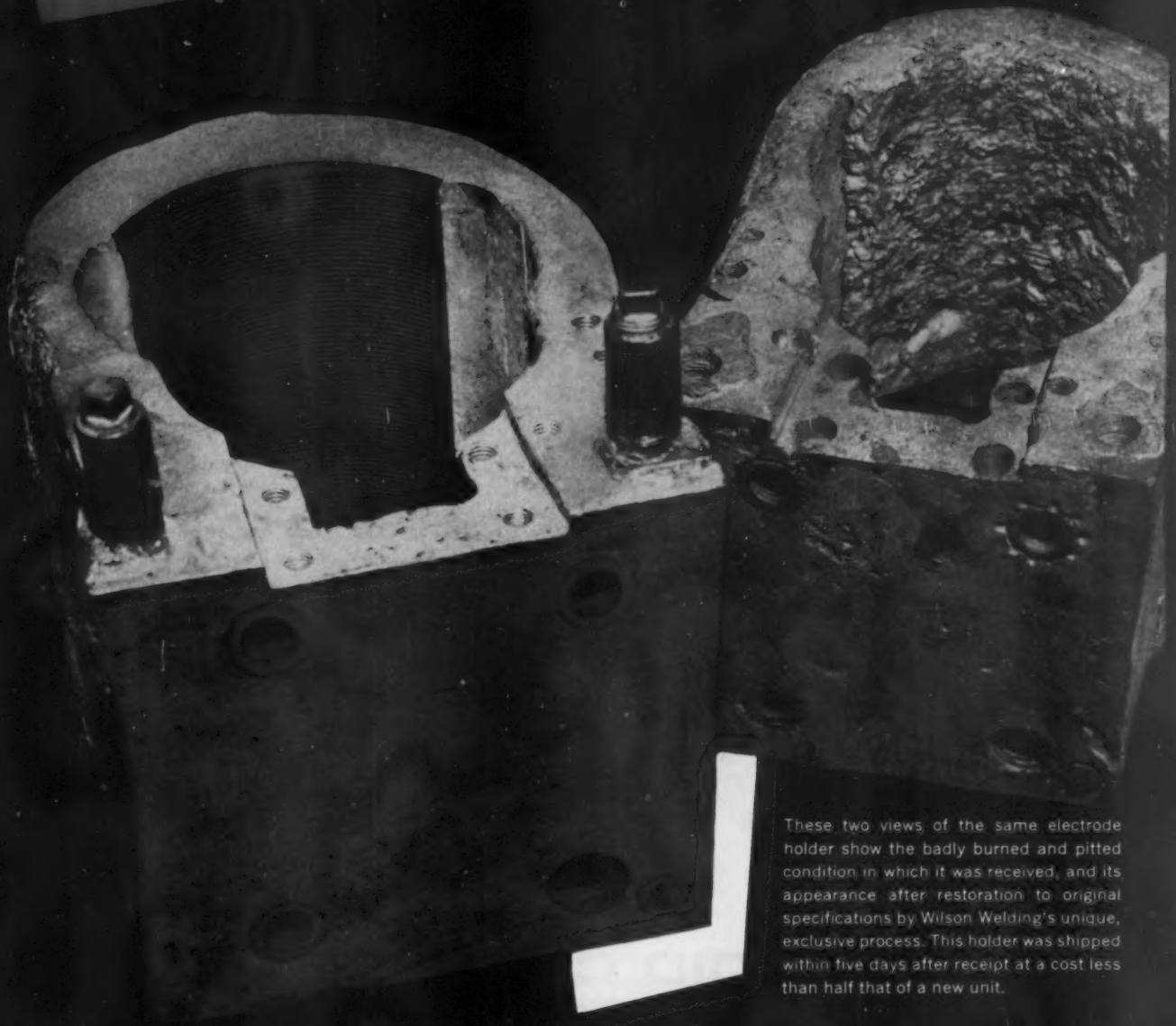
ELECTRODE HOLDERS
BUS TUBES
CABLE CLAMPS
TUYERES

Foundry operators can now save thousands of dollars annually . . . dollars normally spent to replace costly copper components. Wilson Welding Company's patented process of restoring badly burned, pitted or scarred copper units to original specifications, or modified to meet your requirements, is guaranteed to perform and give life expectancy equal to that of new components.

The cost? Wilson prices are based upon amount of labor and material involved but rarely equal 50 per cent of replacement cost.

Wilson's prompt service reduces costly down time, since a representative job is completed and shipped within five days after receipt . . . and in less time for emergencies.

Don't discard or scrap salvageable copper components. Restore them to full efficiency at a fraction of replacement cost. Write or call Wilson Welding Company, Inc. for cost estimate or additional information without obligation.



These two views of the same electrode holder show the badly burned and pitted condition in which it was received, and its appearance after restoration to original specifications by Wilson Welding's unique, exclusive process. This holder was shipped within five days after receipt at a cost less than half that of a new unit.

WILSON WELDING COMPANY, INC.
COPPER AND COPPER ALLOY WELDING
Now serving 300 steel mills and foundries throughout the United States and Canada

WW COMPANY INC

P. O. BOX 1634
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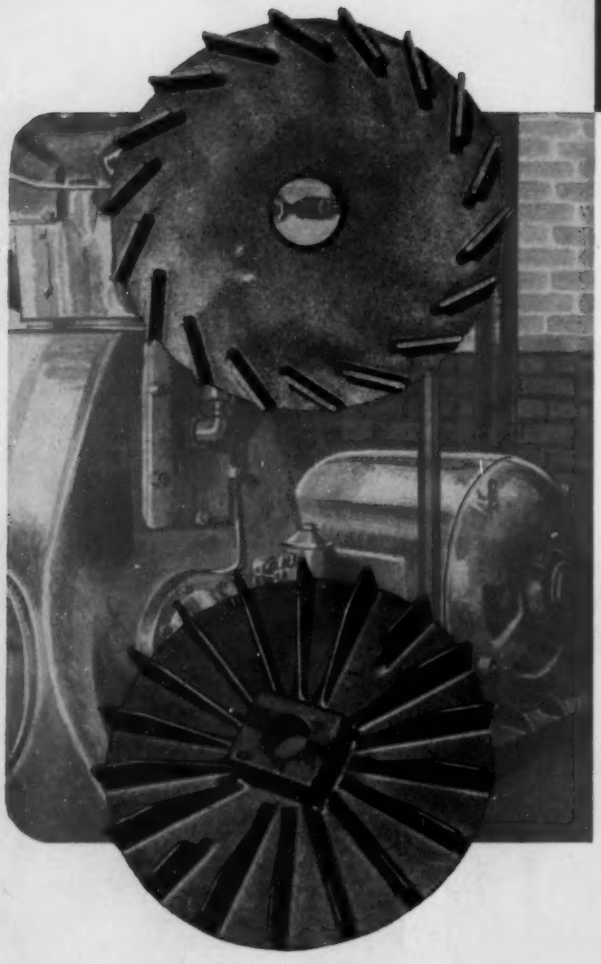
JAckson 3-6281

Metal & Alloy Division
of Silver Creek
Precision Corp. uses . . .

PETRO BOND*

FOR PRECISION BRONZE AND ALUMINUM CASTINGS



METAL & ALLOY DIVISION of Silver Creek Precision Corp. uses PETRO BOND waterless molding sands for intricate bronze and aluminum castings. The silica-bronze electric motor cooling parts shown here were cast in PETRO BOND sands at METAL & ALLOY's Buffalo, New York, foundry. Because of the smooth surfaces and excellent pattern reproduction obtained, METAL & ALLOY has drastically reduced the cost of machining the cooling blades.

PETRO BOND sands are bonded without water . . . permitting the use of fine-grain sands because of less gas. Molds shake out fast, sand doesn't stick to castings.

PETRO BOND produces precision castings with conventional foundry equipment. Castings are sounder . . . with closer tolerances and less porosity . . . there are fewer rejects.

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BAROID CHEMICALS, INC.

A SUBSIDIARY OF NATIONAL LEAD COMPANY
1809 SOUTH COAST BUILDING, HOUSTON 2, TEXAS

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Richmond, Virginia
Brandt Equipment and Supply Company,
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George W. Bryant Core Sands, Inc.,
McConnellsville, New York
The Buckeye Products Company,
Cincinnati, Ohio
Canadian Foundry Supplies & Equipment Ltd.,
Montreal 30, Quebec (Main Office)
Canadian Foundry Supplies & Equipment Ltd.,
Toronto 14, Ontario
Combined Supply & Equipment Company,
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Foundries Materials Company,
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Foundries Materials Company,
Detroit, Michigan
Foundry Service Company,
Birmingham, Alabama
General Refractories Company,
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The Hoffman Foundry Supply Co.,
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Industrial & Foundry Supply Company,
Oakland, California
Interstate Supply and Equipment Co.,
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Boston, Massachusetts
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Western Materials Company,
Chicago, Illinois

Write today for BOOKLET giving further information on the benefits gained from using NATIONAL Western Bentonite.

BAROID

BAROID CHEMICALS, INC.

8136

The Alloy Casting Institute booth described advantages of high-alloy castings

(*Concluded from Page 26*)

leable castings placed in their approximate locations in the car. About 40 malleable iron castings, totaling nearly 100 lb, were shown as typical of what might be found in a 1961 American automobile. A side board illustrated applications of the material in other fields such as agricultural machinery, road building equipment, hand tools, material handling equipment, and railroad hardware.

A free brochure which is entitled "Malleable Puts More Muscle in Machinery" also was available at the booth. It describes how many of the material's engineering properties can be used to advantage for numerous applications.

The Gray Iron Founders' Society booth featured three working exhibits including a hammer test to demonstrate gray iron's damping properties, a compression testing machine to show this material's high compression strength, and a bending machine for testing ductile iron. Another section of the exhibit featured the society's design contest for converting to gray iron castings, and design engineers were encouraged to enter the competition. During the first two days of the show, 6000 wooden nickels were passed out at the exhibit to demonstrate to engineers that they must keep in mind a material's entire range of properties when they evaluate it for a particular application.

The booth sponsored by the Alloy Casting Institute highlighted displays which stressed the benefits offered by high-alloy castings. It also was supplied with material pertaining to the properties and applications of such castings which were available to designers.

NEW FURNACE: A high-frequency induction furnace of 30-kw capacity has been installed in the Auburn University foundry through the courtesy of Westinghouse Electric Corp. and the Birmingham Chapter, AFS. W. Henry Stockham, student, and Dan T. Jones, head professor of Auburn's industrial laboratories look over the console for the motor generator. The furnace itself is in the background, but is not visible in this view

Want high production . . .

and low maintenance too?

PAYLOADER® users say:

"Our H-25 has proved to be a real workhorse — ruggedly constructed for continuous dependable production" . . . "The maintenance on our two Model H-25's has been lower than on any loader previously used" . . . "H-25 gives maximum production output under ideal or adverse conditions."

All PAYLOADER tractor-shovels are not exposed to dusty, dirty conditions, but many are, so Hough engineers take extra effort to design maximum protection into all PAYLOADER models.

For example, this Model H-25 has dual-filtering of engine intake, individual cartridge-type filters on all three oil systems — for the engine, the hydraulics, and the torque-converter/power-shift transmission. Service brakes, hydraulic system, generator, distributor and ignition and starter switches are all sealed. Parking brake is enclosed. In addition, more than 100 "O" rings and other seals are used on the hydraulic and mechanical systems to keep oil and grease in and dirt out.

Whatever size of PAYLOADER tractor-shovel you need, you can be sure it is designed with this same attention to production insurance. Your Hough Distributor will gladly show you how these high-production and low-maintenance features can "ease the profit squeeze" of your bulk handling.

HOUGH®

THE FRANK G. HOUGH CO.
703 Sunnyside Ave.
LIBERTYVILLE, ILLINOIS
SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY

Send "Industrial Materials Handling from A to Z"

Name
Title
Company
Street
City State
7-A-2

Calendar of MEETINGS

July 18-20—Western Plant Maintenance & Engineering Show, Pan Pacific Auditorium, Los Angeles.

August 1—Foundry Facing Manufacturers Association, Executive House, Chicago.

Aug. 28-Sept. 1—International Heat Transfer Conference, University of Colorado, Boulder, Colo.

Sept. 11-13—European Investment Casting Congress, Italy.

Sept. 18-20—Non-Ferrous Founders' Society, annual meeting, Shawnee Inn, Shawnee-on-Delaware, Pa.

Sept. 21—Cast Bronze Bearing Institute, annual meeting, Shawnee Inn, Shawnee-on-Delaware, Pa.

Sept. 21-22—Missouri Valley Regional Foundry Conference, Missouri School of Mines and Metallurgy, Rolla, Mo.

Sept. 22-23—East Coast Regional Foundry Conference, Statler-Hilton Hotel, New York.

Sept. 24-26—Steel Founders' Society of America, fall meeting, Homestead, Hot Springs, Va.

Sept. 27-28—American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago.

Oct. 5-6—Ohio Regional Foundry Conference, Netherland Plaza Hotel, Cincinnati.

Oct. 5-6—Congress of German Foundrymen's Associations, Dusseldorf, Germany.

Oct. 7-10—Conveyor Equipment Manufacturers Association, annual meeting, Ponte Vedra Inn, Ponte Vedra Beach, Fla.

Oct. 13-14—New England Foundry Conference, Massachusetts Institute of Technology, Cambridge, Mass.

Oct. 16-21—National Industrial Sand Association, semiannual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 18-20—Gray Iron Founders' Society, annual meeting, Royal York Hotel, Toronto, Ont.

Oct. 19-20—Michigan Regional Foundry Conference, Kellogg Center, Michigan State University, East Lansing, Mich.

Oct. 19-21—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 23-25—Abrasive Grain Association, fall meeting, Waldorf-Astoria Hotel, New York.

Oct. 23-27—American Society for Metals, National Metal Congress & Exposition, Cobo Hall, Detroit.

Oct. 26-27—Purdue Metals Casting Conference, Purdue University, Lafayette, Ind.

Nov. 13-15—Steel Founders' Society of America, Technical & Operating Conference, Hotel Pick-Carter, Cleveland.

Nov. 15-17—National Foundry Association, annual meeting, Savoy-Hilton Hotel, New York.

Dec. 6-8—American Institute of Mining, Metallurgical, & Petroleum Engineers, Electric Furnace Conference, Penn-Sheraton Hotel, Pittsburgh.

1962

Jan. 22-23—Industrial Heating Equipment Association, annual winter meeting, Drake Hotel, Chicago.

May 7-11—American Foundrymen's Society, 66th Annual Castings Congress & Exposition (held in conjunction with the 29th International Foundry Congress), Cobo Hall, Detroit.

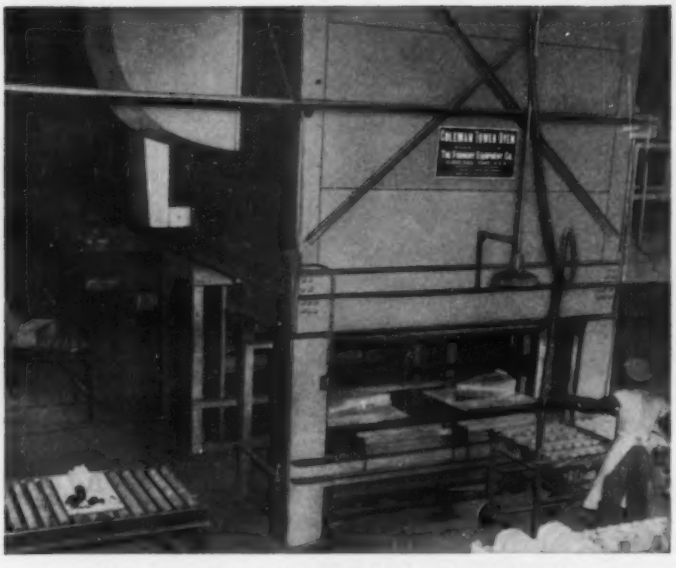
Sept. 25-28—Society of Diecasting Engineers, 2nd National Diecasting Exposition & Congress, Cobo Hall, Detroit.

CUT LABOR COSTS

with

Coleman Dielectric Core Oven in leading plumbing fixture foundry. Direct labor alone reduced by 75%, with many other important savings and advantages.

Coleman Conveyor Core Ovens



Coleman Tower® Core Oven. One of two large installations in a major steel foundry. Mechanized handling and baking of cores up to 150 pounds at substantial annual savings.

● **Performance records in all types of foundries prove that Coleman Conveyor Core Ovens reduce core department costs by as much as 50%!**

Coleman Ovens quickly pay for themselves out of direct savings in labor, materials and reduced casting scrap.

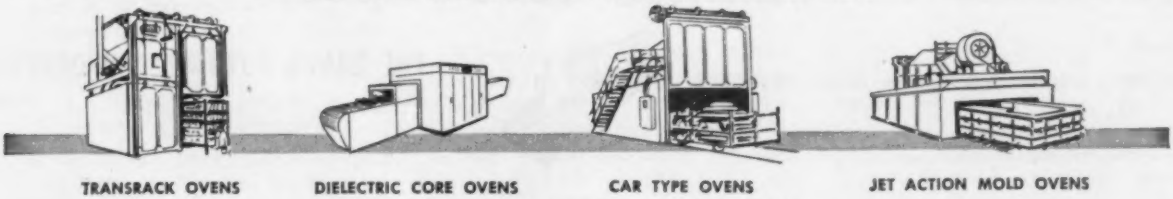
As builders of the world's only complete line of foundry ovens . . . dielectric or recirculating heat . . . we can recommend, without bias, the right oven for your particular needs.

WRITE FOR BULLETIN 54

THE FOUNDRY EQUIPMENT COMPANY • **1821 COLUMBUS ROAD, CLEVELAND 13, OHIO**

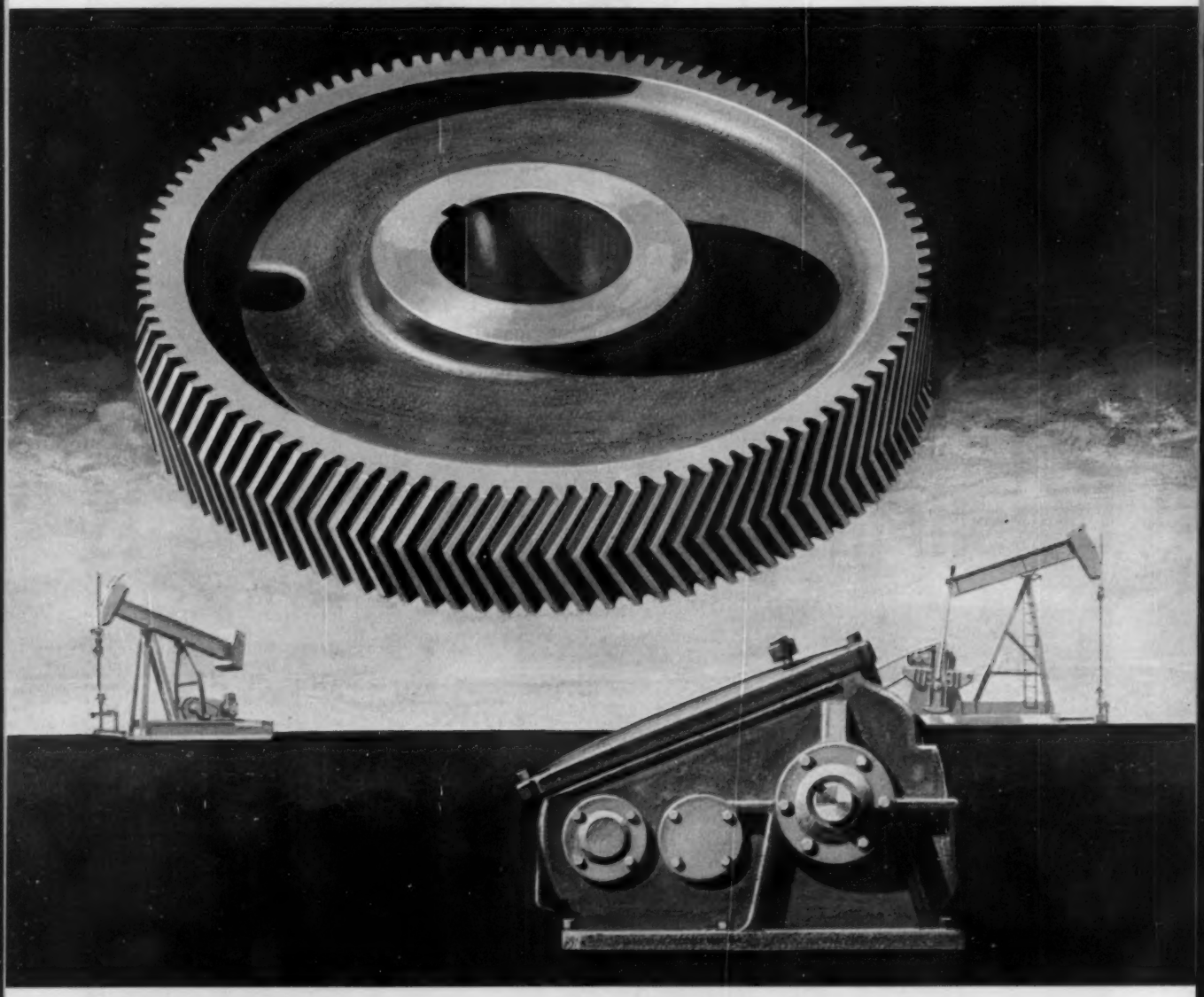
World's Oldest and Largest Foundry Oven Specialists—More than half a century of specialized foundry experience.

PART OF THE WORLD'S ONLY COMPLETE LINE OF FOUNDRY OVENS



TRANSRACK OVENS **DIELECTRIC CORE OVENS** **CAR TYPE OVENS** **JET ACTION MOLD OVENS**

How the Foundry Industry Serves America . . . #16 of a Series



IRON CASTING REPLACES STEEL FORGING, SPEEDS PRODUCTION, CUTS COST 44%

Installed in speed reducers on oil field pumps, this high speed gear has to be strong enough to stand up under load reversal shocks every 180 degrees of gear rotation. Originally, it was produced from a steel forging and cost $77.61 to make. Now, as an iron casting, it's turned out for just $43.39!

Material cost dropped from $36.00 to $21.70 and machining time was cut from 251 to 60 minutes per gear. Estimated annual savings resulting from the change on a complete line of speed reducers—$28,300! What's more, product efficiency improved—because cast iron has its own built-in lubricant to reduce wear on gear teeth.

This is an excellent example of how modern iron castings can solve problems of industrial design and effect substantial manufacturing savings.

For the production of structurally sound iron castings, Hanna Furnace provides foundries with all regular grades of pig iron . . . foundry, malleable, Bessemer, intermediate low phosphorus, as well as Hanna Silvery.

Facts from files of Gray Iron Founders' Society, Inc.

HANNA
MORE KNOW-HOW IN IRON

THE HANNA FURNACE CORPORATION

Boston • Buffalo • Chicago • Detroit
New York • Philadelphia

Hanna Furnace is a division of **NATIONAL STEEL CORPORATION**

For More Information Circle 571, Page 39

READERS' COMMENT

Wrong Author

To THE EDITORS:

Naturally, I was very pleased to see the article on "The Furan Family of Binders" which appeared in your June issue. I was somewhat surprised, however, to see my name in the by-line.

The article actually was written by R. H. Kottke, foundry research supervisor of the Federal Foundry Supply Division, and should have carried his name as author.

I hope that in some way you can bring this fact to the attention of your readers so that Dr. Kottke can have the credit due him for preparing the article.

R. J. MULLIGAN
Marketing Manager
Federal Foundry Supply Div.
Archer-Daniels-Midland Co.
Cleveland 2, Ohio

Work Not Concluded

To THE EDITORS:

Someone apparently was listening too fast at San Francisco and the net result is that in your review of the Heat Transfer session at the AFS convention, I find myself misquoted on page 162 of the June issue of FOUNDRY.

In your review of the Heat Transfer Committee report, you state, "The project to determine heat loss in the runner system has been concluded, the results being presented in the foregoing paper by Hlinka, Paschkis, and Puhr." This statement is incorrect and omits mention of the work at Franklin Institute which was discussed in the committee report.

The situation is this. Paschkis and his co-workers used the heat exchanger equations quoted in their reference, and by judicious selection of constants were able to obtain time-temperature curves which appear to be reasonable for the heat losses of aluminum. They then extended the results to cover other metals.

There is some question about the thermal properties of sand as used in the paper by Hlinka, Paschkis, and Puhr. At Franklin Institute, on the computer, the thermal properties which were fed to the computer were, in the opinion of the committee, quite realistic. However, the analogue computer work indicated that the situation is not quite as simple as shown by the paper of Paschkis and his co-workers. There seems to be another factor present which was not included in the heat exchanger equations and the magnitude of the effect of this factor does not seem to be insignificant.

All of this was outlined or discussed in the Heat Transfer Committee report. As long as there is some question about the thermal properties to be used as constants in the equation and about the X factor which turned up in the analogue computer work, we cannot consider that the work on heat loss in the runner system has been concluded.

W. K. BOCK
Director of Research
National Malleable &
Steel Castings Co.
Cleveland 6, Ohio

Won't Do for Hot Blast

To THE EDITORS:

In "Questions and Answers," February, 1961, Page 89, a reply is given to a correspondent who was considering heating the blast of his cupola by mixing the products of combustion of oil or natural gas with the cupola blast. Based on unpublished experimental work done in a small cupola, exception is taken to your answer.

We found that this procedure was worse than using a cold blast. Blast temperatures obtained in this way had (for example) the following effects on tapping temperatures (other conditions being constant):

Blast Temp, °F	Tapping Temp, °F
120	2720
630	2670
1630	2560

When natural gas was burned and the products of combustion mixed with the air blast to heat it to 640° F, analysis of the blast showed it contained 18.35 per cent oxygen, 1.25 per cent CO_2, 0.004 per

In the interest of the American foundry industry, this series of ads also appears in

STEEL
IRON AGE
MODERN CASTINGS
AMERICAN METAL MARKET

FREE!

REPRINTS OF THIS AD WITH YOUR FIRM'S SIGNATURE

If you would like to have reprints of this ad to mail to your customers and prospects, let us know. Reprints will have no Hanna product message or signature, but will be imprinted with your firm name and address. Absolutely no obligation. To order your reprints, fill in and mail the coupon below.

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Detroit 29, Michigan

Please send me_____reprints of Ad No. _____ (No.)
_____of your Foundry Industry Series.
Imprint as follows:

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Send reprints to:

NAME_____

I understand there is no charge for this service.

For More Information Circle 571, Page 39

WADSWORTH SQUARE TWISTED SOFT STEEL GAGGERS

★ **LOWER COST . . . More pieces per pound!** Twisting a square steel bar creates rigidity and strength. Less steel is required.

★ **COMPARE**

Size Before Twisting (SQUARE TWISTED)	Size O.D. After Twisting (SQUARE TWISTED)	Weight lbs. per ft. (SQUARE TWISTED)	Weight lbs. per ft. (Equivalent Round Steel RE or Plain)	O.D. Size (Equivalent Round Steel RE or Plain)	Square Twisted Gives More Pieces by
3/8"	1/2"	.478	.668	1/2"	39%
1/2"	5/8"	.85	1.04	5/8"	22%
5/8"	7/8"	1.33	2.04	7/8"	24%

Get your copy of our new GAGGER COUNTER CHART. It shows pieces per cwt. and weight per 100 pieces. Available now. Ask your foundry supply house, or write directly to:

WADSWORTH EQUIPMENT CO. ★

P.O. Box 6122 — Ellet Station — Akron 12, Ohio

For More Information Circle 572, Page 39

When melting **STAINLESS STEEL** for casting – you are Guaranteed highest **QUALITY** by using **PRE-ALLOYED FURNACE CHARGES***

TODAY'S CASTINGS DEMAND QUALITY—at Security Alloys our new laboratory allows us to offer a written guarantee on the chemical composition of our alloy scrap. All containers color coded for ease in alloy identification and our analysis will meet the most rigid military and commercial specifications.

Whatever your alloy needs are—you will find them at Security where QUALITY is a process, not just a word.

FOUNDRY DIVISION ***Write for more complete information***

SECURITY ALLOYS CO. INC.

3100 WEST 49th PLACE • CHICAGO 32, ILLINOIS

For More Information Circle 573, Page 39

cent CO, and 136 grains of H_2O per pound of air. Before heating, the blast contained 33 grains of H_2O per pound of air.

An analysis of considerable work along these lines revealed that the adverse effects are (in decreasing order of importance): (1) depletion of the oxygen content of the blast, (2) introduction of moisture, and (3) introduction of carbon dioxide. Because each of these is a concentration effect, it cannot be compensated for by changes in the blast rate or coke ratio. Compensation could be made, however, by introducing oxygen into the blast.

As a general rule, in our setup we found the following effects (all percentages based on weight): (1) Each 1 per cent of oxygen *below* 23.1 per cent decreased tapping temperature by 35° F. (2) Each 1 per cent of water vapor *over* 0.5 per cent decreased tapping temperature by 28° F. (3) Each 1 per cent of carbon dioxide decreased tapping temperature by 8° F.

We concluded a number of years ago that in spite of its low cost, simplicity, and high efficiency, heating of this type is of no commercial value in cupolas.

H. W. Lownie Jr., Chief
Process Metallurgy Research
Battelle Memorial Institute
Columbus 1, Ohio

Safety Overlooked

To The Editors:

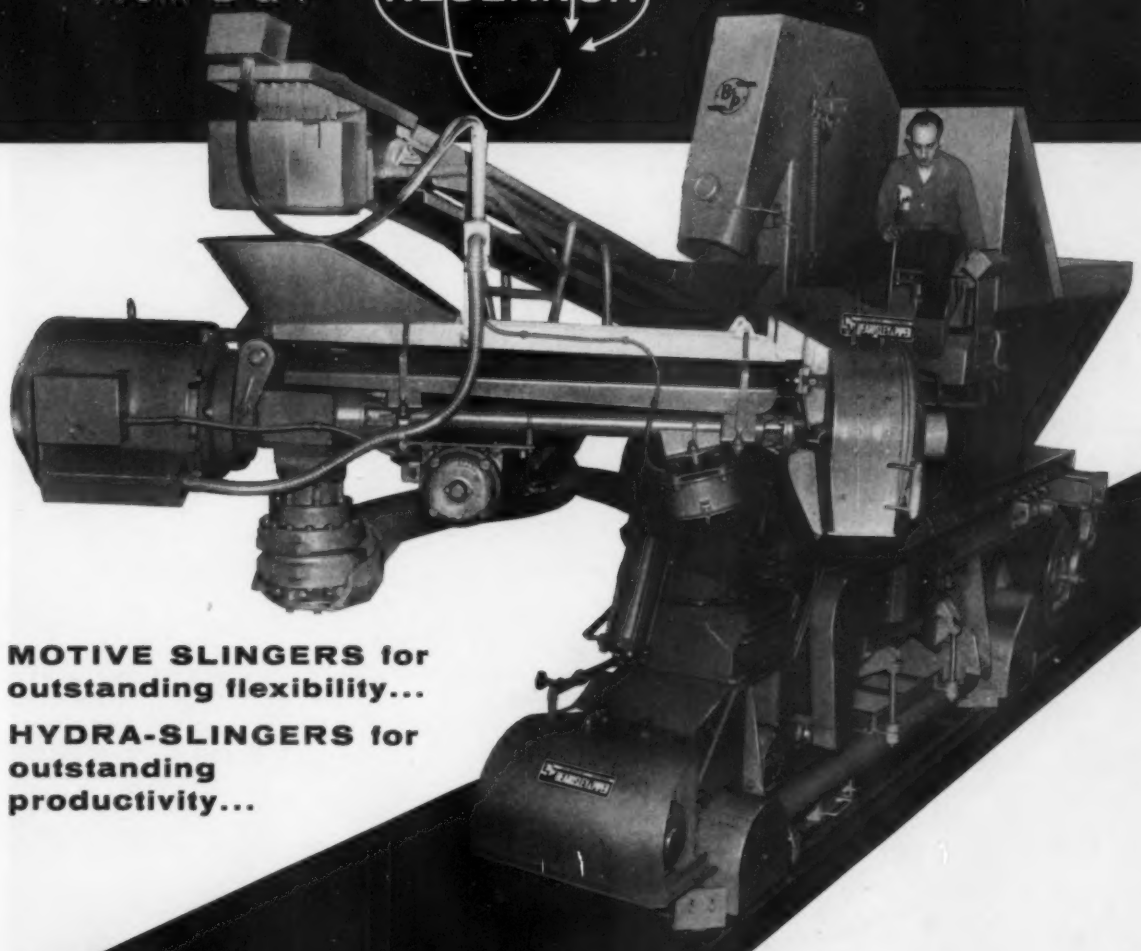
The matter of advertising in the trade magazines indicating a disregard for proper safety practices was a subject of discussion at our Board meeting on April 17, 1961.

It was generally agreed that for quite some time there have been a number of advertisements and articles with pictures showing foundry operations with men not wearing safety goggles or safety equipment. This obvious oversight defeats the activities and efforts of our Safety Committees toward effective safety.

It seems to us that in reviewing these advertisements and articles with pictures, that it would be a very simple matter to make corrections which would promote safety.

Harry Blumenthal
Chairman
Twin City Chapter, AFS
63 South Robert Street
St. Paul 7, Minn.

From B & P RESEARCH



MOTIVE SLINGERS for outstanding flexibility...

HYDRA-SLINGERS for outstanding productivity...

and now...the

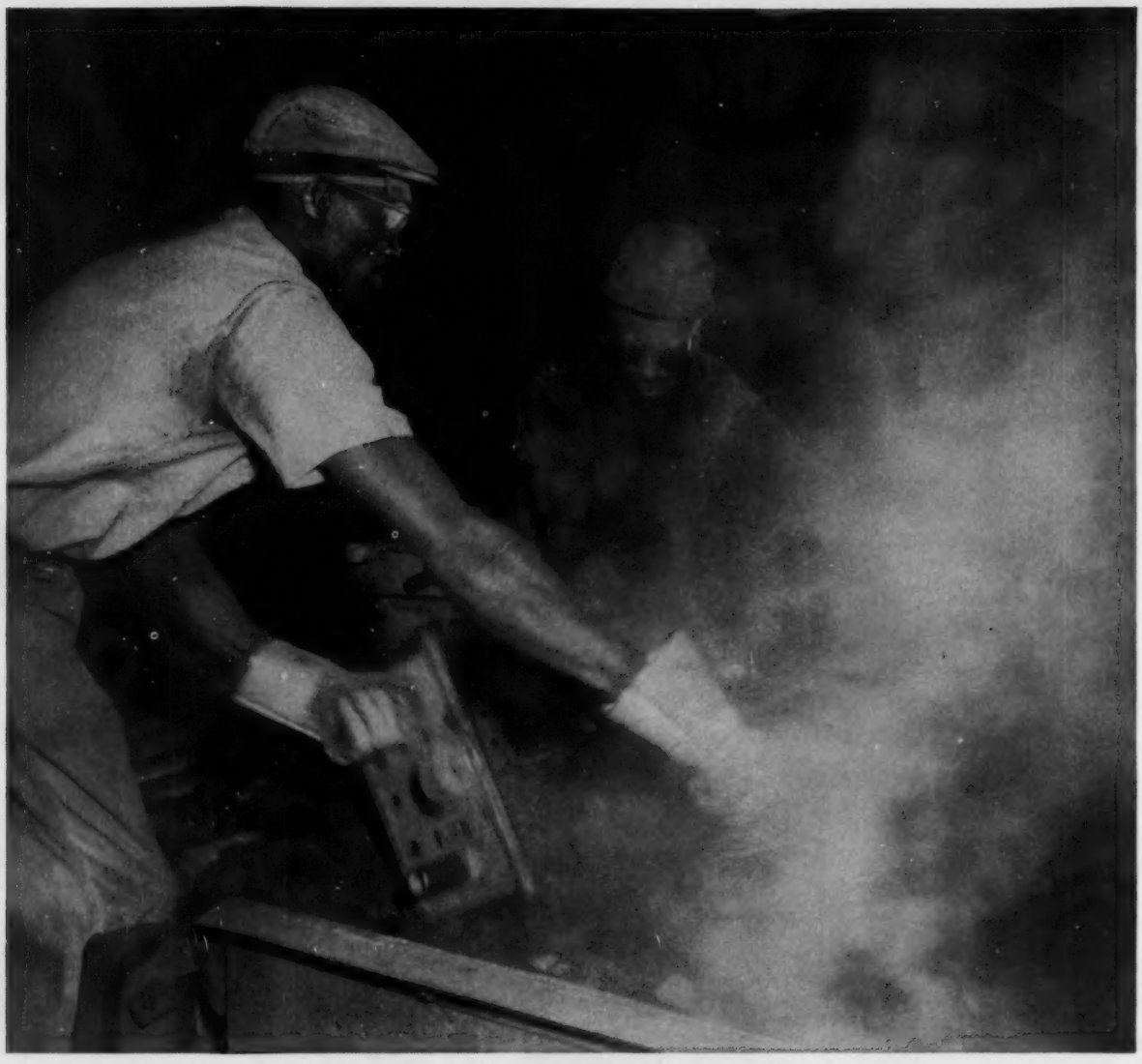
MOTIVE HYDRA-SLINGER

For More Information Circle 574, Page 39

... providing proven Motive Sandslinger quality with increased capacity and precise hydraulic control. The Motive Hydra-Slinger requires no more space than the Motive Sandslinger and uses the same 3 ft. gauge track. Its ramming capacity of 12 to 15 cubic feet per minute is attained without increasing the unit's size. Remote hydraulic control, with operator's station located on the unit's tower eliminates manual effort, affords optimum visibility and assures greater accuracy. Now for the first time jobbing shops can obtain the increased productive capacity and efficiency that may previously have been considered economically unfeasible.

Write for additional information today!

BEARDSLEY & PIPER
Div. of Pettibone Mulliken Corp.
2424 N. Cicero Ave., Chicago 39, Ill.



Where belts carrying hot sand now last 50% longer

THOSE men are dumping hot sand from molds into a shake-out grid. The 250-degree sand falls through the grid and down on a conveyor belt nine feet below. But the heat is so intense it even blistered and scorched rubber belts that were supposed to have been specially designed for hot-material service. Belts were only lasting 3 or 4 months.

When a B.F.Goodrich man heard of the problem, he recommended a new conveyor belt called Solarflex. This B.F.Goodrich belt is made of a special rubber that stays soft and pliable at temperatures that cause other belts to harden, crack and finally break down.

Since 1954, B.F.Goodrich Solarflex belts have been used exclusively on this job. Because of their greater resistance to heat, they last from six to nine months—a 50% increase in belt life.

In this plant, the maintenance supervisor had a good rule which hundreds of others like him follow. Instead of accepting the high cost of frequent replacements, he called in a B.F.Goodrich representative and found exactly what he needed to cut costs and keep the foundry running with fewer shutdowns and delays.

Your B.F.Goodrich distributor has exact specifications for the B.F.Goodrich belt described here. And, as a factory-trained specialist in rubber products, he can answer your questions about the many rubber products B.F.Goodrich makes for industry. *B.F.Goodrich Industrial Products Co., Dept. M-133, Akron 18, Ohio.*

B.F.Goodrich

CONVEYOR BELTS

FOUNDRY
Reader Information Service

Advertising content is classified by subject and listed by page number for your convenience when studying specific foundry applications. For further information on subjects advertised, refer to advertisement on the page indicated and circle Item Number on Reader Service Card —Page 39.

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FOUNDRY

Reader Information Service

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FOUNDRY

JULY 1961

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425	455	485	515	545	575	605	635	665	695	725	755	785	815	845	875
426	456	486	516	546	576	606	636	666	696	726	756	786	816	846	876
427	457	487	517	547	577	607	637	667	697	727	757	787	817	847	877
428	458	488	518	548	578	608	638	668	698	728	758	788	818	848	878
429	459	489	519	549	579	609	639	669	699	729	759	789	819	849	879
430	460	490	520	550	580	610	640	670	700	730	760	790	820	850	880

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401	431	461	491	521	551	581	611	641	671	701	731	761	791	821	851
402	432	462	492	522	552	582	612	642	672	702	732	762	792	822	852
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413	443	473	503	533	563	593	623	653	683	713	743	773	803	833	863
414	444	474	504	534	564	594	624	654	684	714	744	774	804	834	864
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423	453	483	513	543	573	603	633	663	693	723	753	783	813	843	873
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THE PURECO CO_2 "BLUE LINE"

cuts core hardening time from hours to seconds

SAVE WITH PURECO CO_2 "FLASH CURING"

The Pure Blue Line of quality running to your core shooter, core box or mold means extensive savings in time and money. The Pureco CO_2 "*Flash Curing*" process cuts hardening time from hours to seconds . . . no costly baking ovens are needed . . . valuable space is saved . . . more accurate castings with smoother finish result. Mold drying is eliminated . . . rapid production of finished cores expedites rush orders. In-plant handling time is drastically reduced.

"Flash Curing" installation simple.

Pureco can tailor a "*Flash Curing*" installation for production or custom work to meet your specific foundry requirements—large or small. Cost is low—installation simple.

Have a "Flash Curing" demonstration!

Pureco would like to demonstrate its "*Flash Curing*" process in your foundry under your working conditions, with no obligation on your part. Call your local Pureco man or write:

PURECO CO_2

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Pure Carbonic Company, A Division of Air Reduction Company, Incorporated

Nation-Wide Pureco CO_2 Service-Distributing Stations in Principal Cities

General Offices: 150 East 42nd Street, New York 17, N.Y.

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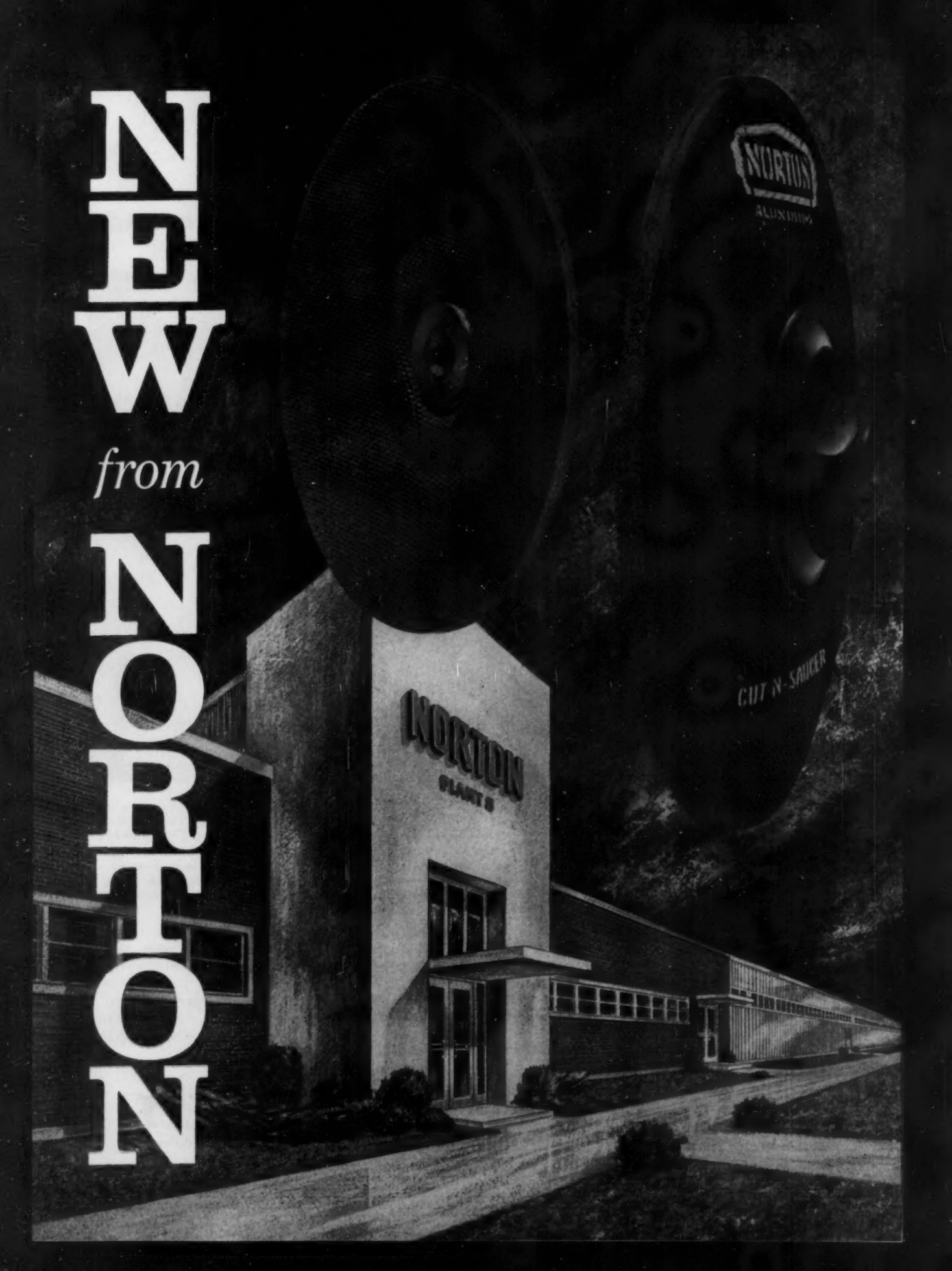
NEW
from
NORTON
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PLANT 2
CUT-N-SAUCER

CUT-N-SAUCER wheels with DIS-CARD mounts

A new combination from Norton's newest plant

For easier, faster weld-grinding, light snagging and many other portable grinding jobs, Norton now offers you:

The only reinforced wheels that combine a saucer shape with a disposable mount.

These are the new BSA Type Cut-N-Saucer wheels with Dis-Card mounts . . . available in 7″ and 9″ diameters. They are produced in the big new Norton Plant 8, built specifically to improve the manufacture and performance of resinoid wheels.

Reinforced with layers of fibre glass, BSA Cut-N-Saucer wheels gain added advantages from the new shape. Compared with straight wheels, BSA wheels on the job can be held at angles much closer to the horizontal. Results are easier control and reduced operator fatigue.

The Dis-Card mount is equally new and vital. Unlike ordinary mounts it is no separate attachment. It is permanently secured — designed to be bought and thrown away with every wheel. This means you can change wheels in seconds — completely eliminating "lock washer" action and the usual mounting routine that can take up to half an hour. So every Cut-N-Saucer wheel you buy is already mounted — and *stays* mounted, throughout wheel life.

Yet you pay no more for a Norton Cut-N-Saucer than for a conventional reinforced wheel!

Cash in on this first opportunity ever offered to you to get advantages never before combined in a single, standard priced, portable grinding wheel. For further facts on the new BSA wheels — or on straight wheels also with Dis-Card mounts — see your Norton Distributor, or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

NORTON
ABRASIVES

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Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Non-Slip Floors — **BEHR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

The Deming Company Reports on Shalco Shell Core Molding:

"A Vein-resistant Core Every Two Minutes... for 52% Less!"

There is good reason why The Deming Company, Salem, Ohio, considers two Shalco U-180 Shell Core Molding Machines an extremely sound investment; Assistant Plant Superintendent Jack Kerr puts it this way:

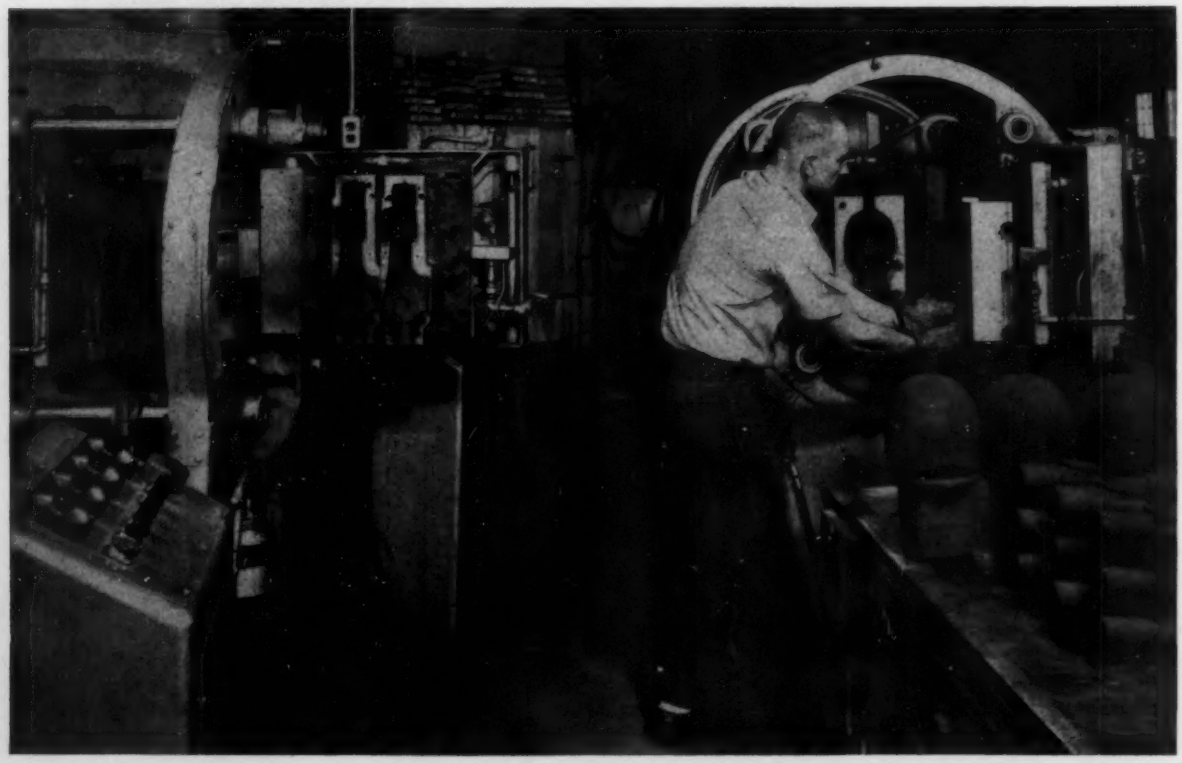
"In the last two years, we converted over 65 jobs to our Shalco machines and, as a result, saved money and increased product quality. For example, take one of our centrifugal casing cores that we used to make in halves with bench core makers. On the Shalcos, we eliminate pasting and sealing operations plus a two hour drying cycle . . . get a vein-resistant core every two minutes for 52% less. On the average job transferred to the Shalcos, we increase production 41% and require but ⅓ as much handling time. What's more, Shalco cores have far greater storage life than oil and sand cores and less moisture-drawing tendencies. There is also an average 10% savings in material."

Consider carefully what savings like those realized by The Deming Company could do for your profit picture. Then, call, write or wire for complete information.

Shalco Division of
National Acme
THE NATIONAL ACME COMPANY
173 E. 131st STREET
CLEVELAND 8, OHIO

Sales Offices: Newark 2, N. J., Chicago 6, Ill., Detroit 27, Mich.
Licensee in the United Kingdom: Stone-Wallwork, Limited, London SW-1, England

At The Deming Company, well-known manufacturer of "Pumps for all uses", one man operates two Shalco U-180's; produces top quality shell cores like those on the table.



WHEREVER METALS ARE CAST... FOUNDRY
JULY 1961

The Weak Link

You can obtain a better guarantee on the car you buy today than on the one you bought a few years ago. This guarantee is the automobile companies' answer to demands for improved product quality. There is a similar trend in other industries, including that of cast metals.

Complaints of buyers about quality of manufactured goods increased steadily once the many shortages of the early postwar period had been overcome. The buyer again became king—and choosey.

Apparently, however, it has been difficult in some instances to change the bad habits which result in the production of below-par merchandise. The solution to this problem naturally will vary somewhat from company to company, but one basic principle of business operation should be checked as the possible seat of trouble. It is the requirement that, from top management down to the rank and file, there be complete understanding of the company's aims and how they are to be achieved. It is commonly referred to as communications.

To be effective, of course, good communications must be accompanied by the establishment of sound standards—standards which, if met, result in a quality product.

Pick out any foundry that operates consistently with a low scrap rate and you'll find 1) that supervisors and subordinates are in agreement on procedures and 2) that the various department heads are in frequent communication about ways in which those procedures can be changed so as to improve quality.

Quality is not the responsibility of any one department to the exclusion of others. When things go wrong, it's easy enough for the molder to pass on the blame to the melter or muller man, but avoiding responsibility doesn't solve the problem. The answer lies in a joint examination of the situation by those responsible for production processes and inspection—followed by corrective action based on what the examination discloses.

The drive toward improved casting quality can be successful, but not if it is handicapped by the weak link of haphazard communications.

William G. Bude
Editor

NEW BRASS FOUNDRY

Anticipates Market Growth

- Versatility is a major quality of Neptune Meter Co.'s new shop.
- Core storage and delivery are conveyorized.
- Six molding areas range from a mechanized loop to floor work.
- Phases of casting cleaning are automated.

By ROBERT H. HERRMANN
Associate Editor

● HAVE YOU ever seen a foundry so new that the green sand is natural-colored instead of black? So new that the bottom boards, smelling like the fresh lumber they are, have no charred spots? So new that the reds, greens, and yellows of newly-installed modern equipment glisten in sunlight streaming through clear glass.

That's the way the Neptune Meter Co. foundry at Maspeth, N. Y., looked a few weeks ago when the first whistle blew for the start of brass and bronze castings production. Castings output is exclusively for liquid meters and accessories of the company's own manufacture.

The new modern foundry building, then temporarily surrounded by construction shacks and debris, by now is a neatly landscaped, mechanized industrial facility close to water and convenient freeway transportation. The rectangular building provides 50,400 sq ft of production and office floor space. Exhaust systems through bag and wet type collectors remove dusty air from foundry and pattern shop areas at the rate of over 155,000 cfm. Incoming air, heated in winter, provides a continually-cleaned, comfortable atmosphere in the plant. A high level of illumination suitable to the tasks involved is maintained in all areas.

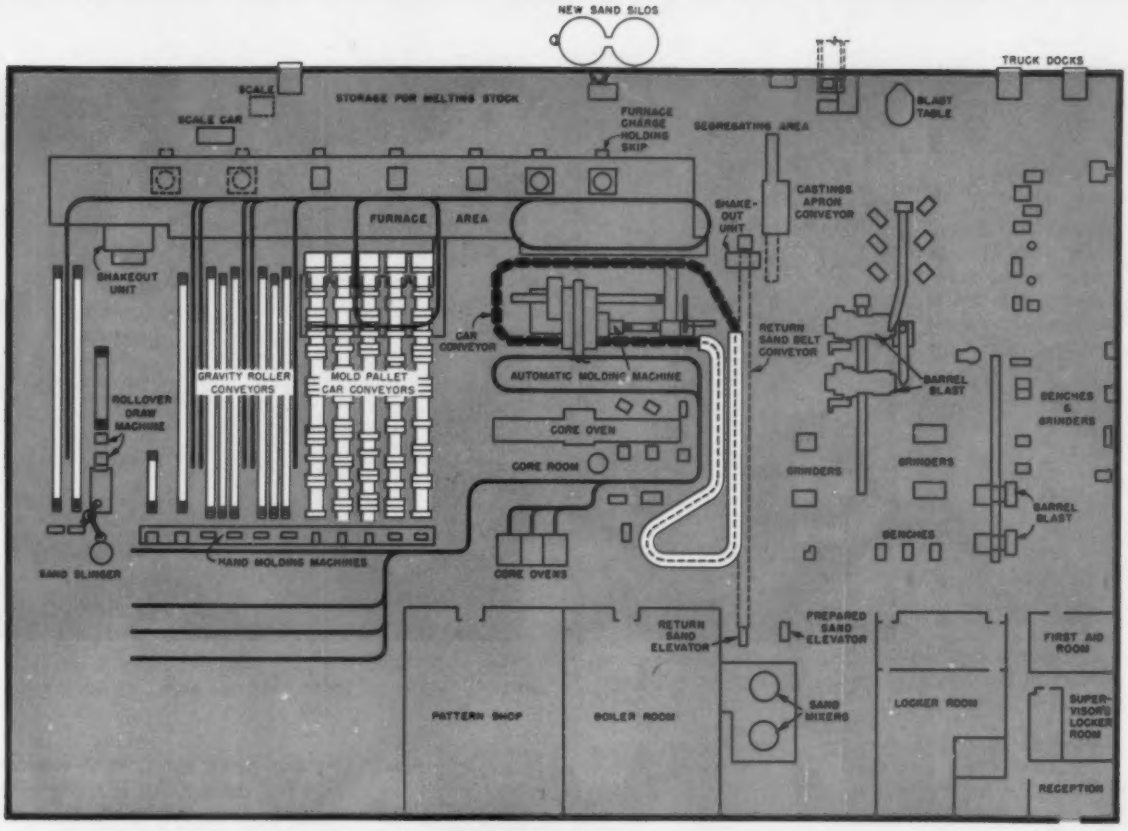
In addition to production space, the new building provides areas for offices, shower and locker rooms, a pattern shop and storage area, a cafeteria, and a sand and metallurgical laboratory.

All production has been removed from the old foundry in Long Island City. Reasons which led to the decision to build the new foundry were outlined by W. H. Cochrane, president. "The projected growth in the country's population and industry will boost future demand for housing and factory facilities and, consequently, for water and other types of liquid meters.

"The long-range growth outlook was a primary reason for building the new foundry. The capacity of our old foundry could not be increased, and its efficiency was not high because of its age and old equipment. The greater capacity and increased efficiency which we will achieve with the new installation should improve greatly our ability to serve our customers."

Versatile Molding — Six molding areas provide for different types of work in snap and tight flasks from about 12 x 14 in. to 36 x 48 in. A high degree of mechanization is achieved on a molding loop equipped with a pair of automatic blow squeeze machines. The line has a capacity of 240 molds an hour in 20 x 28 in. flasks. Adaptability is achieved here by use of split patterns with two or four interchangeable segments which can be changed in a few minutes.

A man with a clamping fixture on a hoist lifts a cope off a flask assembly on a roller conveyor and puts the cope on a wheel conveyor feeding the cope machine. The drag flask continues on powered rollers into a hydraulic rollover device. A shuttle frame pulls the rolled-over flask over the pattern, which is raised by hydraulic cylinder to engage the flask and stop against the



Varied equipment at the Neptune Meter Co. foundry provides for continuous or intermittent production, straight flow or surge area handling, and for large or small castings production

Worker uses an air hoist with bail to lift a cope from molding machine roll-out conveyor in background and closes drag molds on the car conveyor

Monorail-carried mold weights are in place, left, as worker on moving platform pours molds. Exhaust hood behind mold conveyor removes smoke and fumes

Molds made on the jolt squeezer line are set off on wheeled pallet cars and are rolled to a pouring area at far end of the rails

machine blowplate.

Following the blow, the mold is squeezed by the hydraulic cylinder and lowered to a wheel conveyor. As the shuttle pulls in another empty flask, it pushes the half mold to a second hydraulic rollover. On its next trip, the shuttle pushes it to a car conveyor.

Cores are set by hand. Copes, produced on the second machine, are hurried on powered rollers from the machine to the closing station. Here the copes are lifted by an air clamp and bail on a hoist, and the molds are closed. Weights, carried by special holders on a monorail conveyor, lower automatically to the molds. Workers, standing on a moving platform, pour the molds from monorail-suspended ladles under an exhaust hood.

As the molds emerge from a cooling tunnel, an air ram pushes them to a platform from which another ram pushes them under a third ram which punches sand and castings out to an oscillating conveyor in the basement.

Squeezer Work—A jolt squeezer line for producing small snap flask work is equipped with five molding machines. Workers set molds off to wheeled pallet cars which roll on waist-high rails to the pouring area. As the molds are to be poured, a worker pulls the wheeled pallet under a weight lowering device. Jackets are placed on the molds and the weights lowered by push-button-controlled air cylinder.

Molds are poured with monorail-suspended ladles to which movable exhaust hoses with hoods may be snapped on and off. The exhaust devices are attached to all pouring ladles in the foundry. They are removed when ladles are rolled to the furnaces to receive metal.

The weights are released from the molds and the wheeled pallet pulled to the ends of the rails to rest on an air-cylinder-tilted section of rail. Sand and castings fall to a basement oscillating conveyor. The pallet, retaining the bottom boards, is tilted back to roll off on a set of rails below those previously described. It rolls back to the molding end to an air-cylinder-raised section which lifts it level with the upper rails, in position to receive additional molds.

Two pairs of jolt squeeze strip machines are situated in the same line with the squeezer units. They produce tight flask cope and drag work, and the molds are set off to two roller conveyors, one serving each pair of machines. Twenty-two lever-action clamping devices along each conveyor apply pressure to the tops of the molds and act as weights during pouring.

Clamping pressure is released from the poured molds, which are pushed to the end of the conveyor where stops hold the bottom boards, permitting the flasked mold to slide off on angle iron ways. Sand and castings fall through an opening to the oscillating conveyor in the basement. Flasks and boards are returned to the molders on a gravity roller conveyor.

Jolt Rollover Line—Two jolt rollover machines make 24 x 30-in. molds which are set off on two roller conveyors mounted about 15 in. off the floor. Poured molds are moved by bridge crane to a hooded, vibrating shakeout.

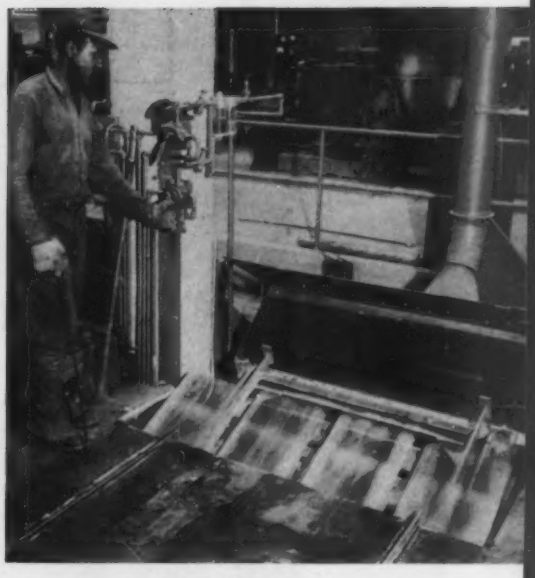
The largest molds, 36 x 48 in. flask size, are rammed on a roller conveyor by a joy-stick-controlled sand slinger. A rollover draw unit is mounted in the conveyor line. A bridge crane moves poured molds to the hooded shakeout.

The sixth molding area is for specialty work hand-rammed on benches or on the floor. Molds are set on two roller conveyors for pouring and then moved by crane to the shakeout.

Molding Sand—Shakeout and spill sand from the basement conveyors is fed to a bucket elevator and raised 84 ft to a barrel screen and then through a flat vibrating screen to a belt conveyor for distribution to any of four 75-ton capacity silos.

Sand mixes are prepared in two mullers, each situated under two of the sand silos. Sand is released from the silos through air-cylinder-operated gates to batch hoppers in each muller enclosure. Dry binders, from

Exhaust hoods on flexible pipe are attached to ladles during pouring. Molds are weighted in special fixtures



After molds are dumped, wheeled pallets with bottom boards tip back as shown here and roll to molders

bags raised to the sand preparation mezzanine by high lift trucks, are measured by scoop into the mix. Water is metered.

Batches consist of 2 tons AFS 130 base sand, with additions of southern bentonite, fireclay, and wood flour. Prepared sand discharged from the mullers is elevated to an aerator which empties to a distribution belt over molders' hoppers. Flows are controlled by level sensing devices in the hoppers.

A sand laboratory is maintained in a room off the sand preparation mezzanine. Hourly tests help maintain green strength at 10-12 psi, permeability at 32-33, moisture at 4 per cent, and flowability at 75. Daily tests are made to determine grain size and distribution, ignition and combustion characteristics, and clay content.

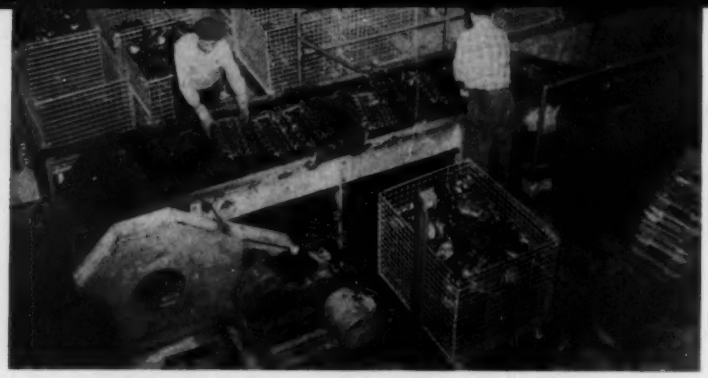
Coremaking—AFS 130 sand also is used for cores. It is moved from either of two 75-ton capacity silos by pneumatic conveyor to a two-compartment hopper over a 500-lb muller. Each hopper compartment holds 3 tons.

Prepared sand is discharged to a wheeled, drop-bottom hopper buggy on the mezzanine. A worker wheels the buggy over grated openings in the mezzanine floor to replenish hoppers over coremaking machines on the main floor.

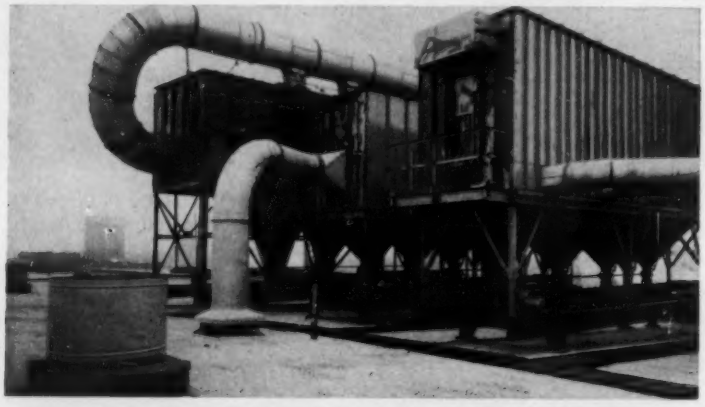
A water-based binder sand for dielectric drying is used for the small

Large molds are rammed by sand slinger on a roller conveyor then rolled to the rockover draw machine shown at the left

A bridge crane moves most molds made on the slinger line, the jolt rollover line, and on the hand molding floor to this shakeout



Inclined apron conveyor brings castings from the basement shakeout into the cleaning room. Workers sort the castings into wire grid boxes



Collectors on roof handle 155,000 cfm of dust, smoke, and fume-laden air

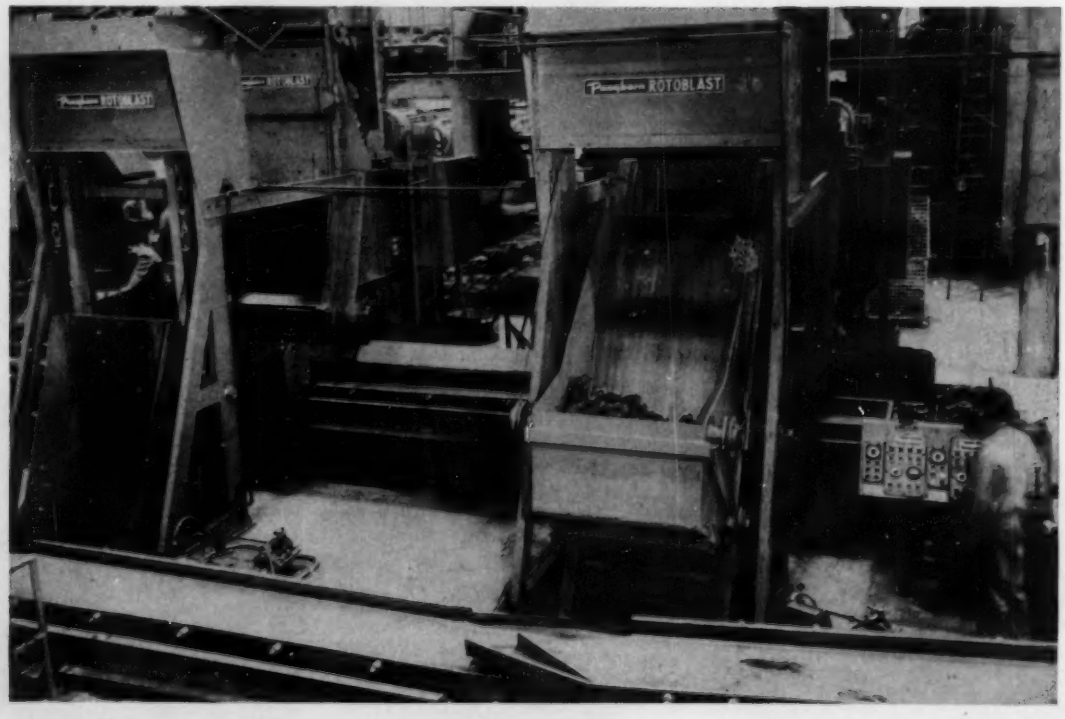
cores comprising 90 per cent of the cores used in the foundry. They are made on four blowers and on two benches for hand ramming. Core-making stations are situated on each side of a conveyor feeding the dielectric oven. Drying time is about 4 minutes.

Workers remove cores from the belt at the exit side of the oven, rub off any fins and do other finishing work, then set the cores on shelves of monorail-suspended carriers. The carriers are pushed to the molding lines or to a storage area comprised of several parallel segments of monorail on which the carriers rest.

Larger cores are produced from oil-bonded sand on a rollover machine or are hand-rammed on a bench. These cores are loaded in the green state to shelves on monorail carriers which are pushed into any of three gas-fired ovens. After the cores are baked, the carriers are rolled out of the oven. Finishing work is performed on the cores which are replaced on the carrier and rolled to molders or to the storage area.

Castings Cleaning—Castings from the basement shakeout are brought

Conveyor in foreground switches automatically to feed castings to either skip loader. After cleaning in automatically-cycled machines, castings are discharged to the oscillating conveyor shown across middle of photo



into the cleaning room sorting area on an inclined apron conveyor. Workers sort castings into wire grid tote boxes. Castings shaken out on the main floor are loaded into tote boxes at shakeout and trucked to the cleaning room.

Small castings are cleaned in a table blast unit then moved to a press for removal of the sprue. Runners are sheared off in a second punch press. The castings are inspected, weighed, and shipped.

Other castings are degated in a line of four punch presses, one abrasive wheel, and one band saw. A short length of intermittently-operated belt conveyor at each of the cut-off machines empties into a common oscillating conveyor. The operator at each of the machines loads his belt conveyor with 20 cu ft of trimmed castings. At the proper time he starts the belt conveyor which dumps the castings to the oscillating conveyor. It has a section which is switched by air cylinder to direct the castings to a skip hoist loader at either of two automatic tumble-blast cleaning machines.

The skip loader at the first tumble-blast machine energizes the air cylinder that moves the switch section of conveyor. When the skip is loaded, the switch is moved to direct a casting load to the second skip loader and vice versa.

The blast cleaning machines discharge cleaned castings to a common oscillating conveyor which spills into containers for inspection. Castings are segregated according to good, rough, and scrap categories. Boxes of scrap castings are trucked to the melting area. Rough castings are ground on double-end pedestal grinders or are cleaned with portable grinding and chipping tools at grated, down-draft work tables. The castings are recleaned in a small skip-loaded tumble-blast machine which discharges to box trucks.

The largest castings, and low production items are cleaned with portable tools on benches along a wall of the building in this area.

All meter casings are pressure-tested for possible leakage. Testing is done by clamping the casings against rubber gaskets in a fixture. Each casing is lowered into a tank of water and air at 80 psi is blown into the casing. Formation of bubbles indicates a leak.

Melting—Highway trucks deliver brass ingot to the foundry in 2000-lb loads steel-banded to pallets. Fork trucks unload the pallets to a scale for weighing-in, then set the pallet under an opening in a mezzanine above. A bridge crane hoists the pallet to the mezzanine and aligns it with others along floor rails for a power-driven, scale car for making up charges. Boxes of home scrap of known analysis also are hoisted to the charge makeup mezzanine. No purchased scrap is used.

Charges made up in the tilting scoop of the charge car are dumped to a tilting box in the mezzanine floor, above each of three rocking electric melting furnaces. An air cylinder tilts the box to empty the load down a chute to a furnace.

Two of the furnaces have capacities of 1500 lb; capacity of the third is 2000 lb. Metal is tapped at 2250° F. Two nose tilting induction furnaces also are available. They are charged by orange peel bottom buckets; each furnace will melt 1500 lb an hour.

Regular alloy checks are made in an electro-analyzer for copper, lead, and tin content. The other ingredients are determined by wet methods of testing.

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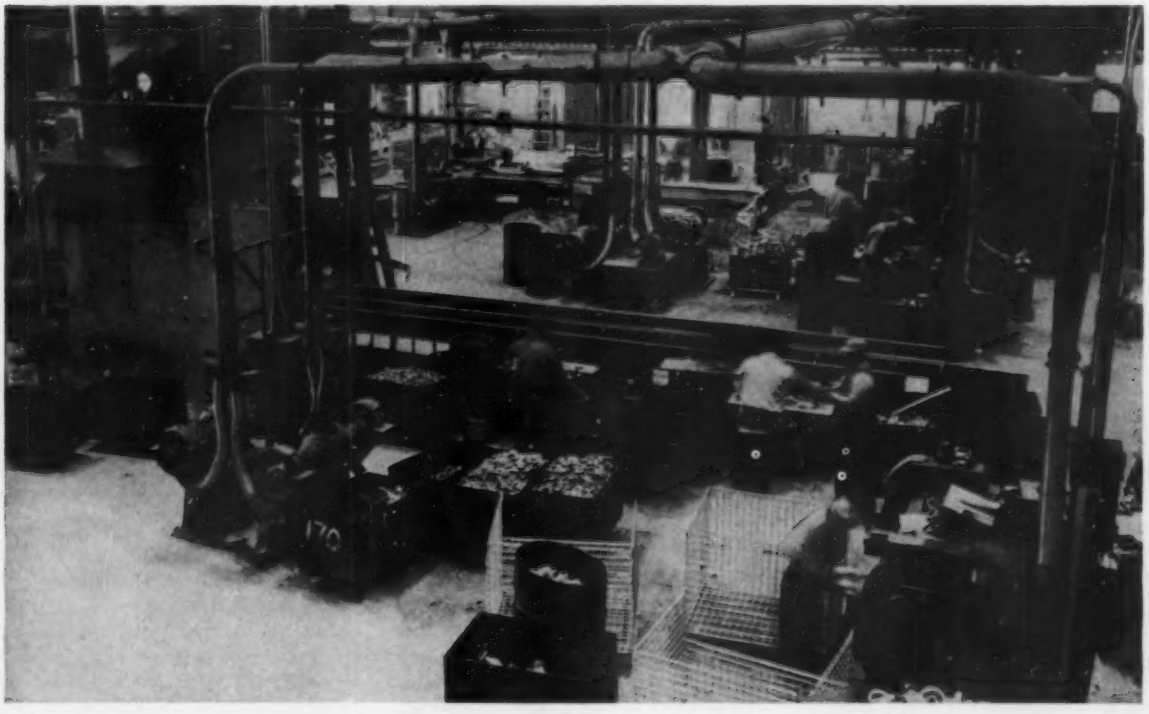
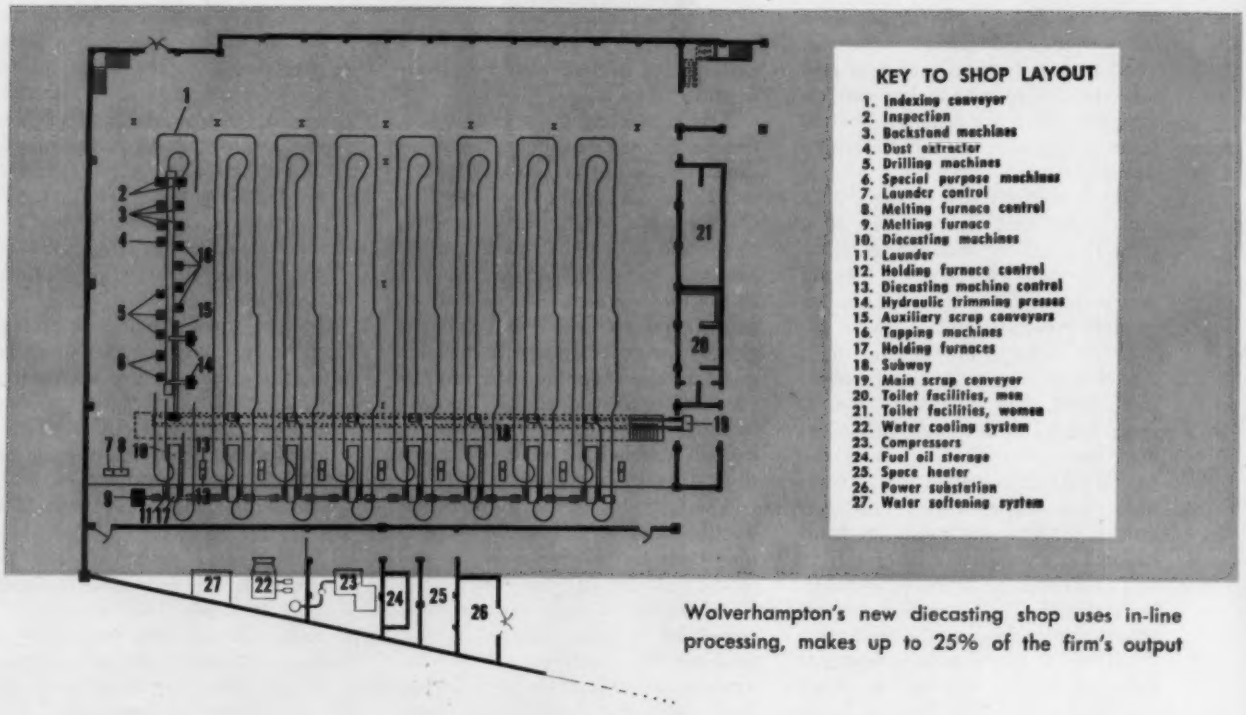
Castings are conveyed from the airless blast barrel cleaning machines to tote boxes for trucking to inspection and grinding stations shown here





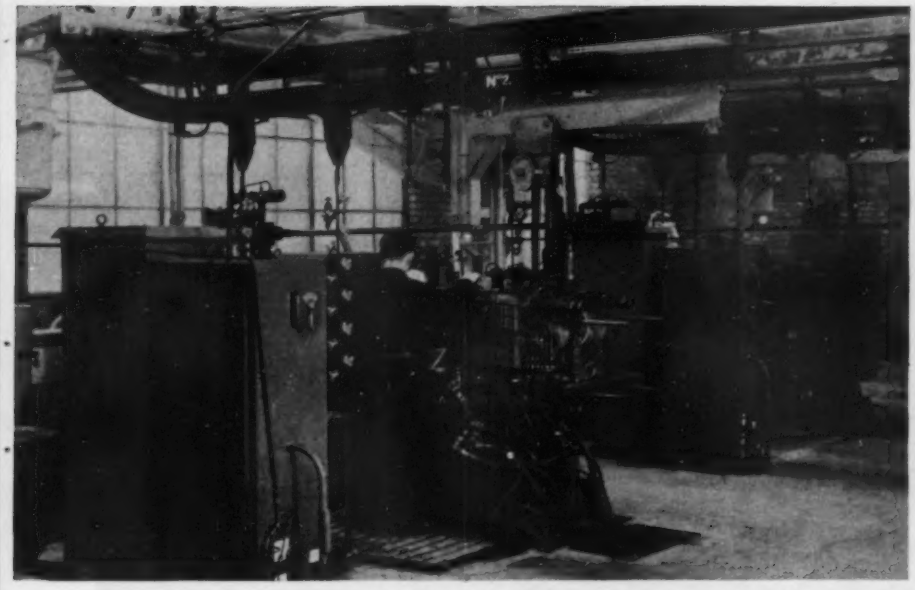
Wolverhampton's new diecasting shop uses in-line processing, makes up to 25% of the firm's output

Materials Handled Efficiently by

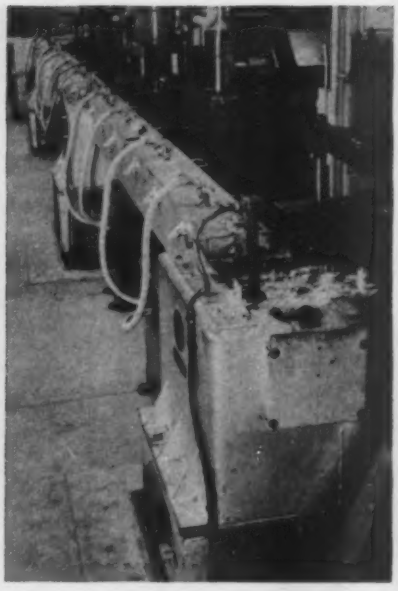
JOBBING DIECASTER

This diecaster solved the problem of matching diecasting production to finishing operations by using line processing. Now, all castings produced on three daily shifts are finished on one

By HIRAM K. BARTON
Hiram Barton Associates
Etchingham, Sussex, England



These are two of eight diecasting machines in this shop. Each machine has a built-in holding furnace



View shows the heated launder or trough connecting the eight holding furnaces to two melting units

● A JOBBING diecaster's major problem is to maximize casting machine utilization and, at the same time, minimize storage and handling of raw and partly-finished castings. Some diecast parts require only trimming and inspection prior to packing, but many have to undergo a sequence of minor machining operations before dispatch to the customer.

It is the handling of this in-progress work that gives the jobber his biggest headaches. A successful system of handling work in process has been developed by Wolverhampton Die Casting Co., Wolverhampton, England.

Diecasting often is described as the quickest way of producing a semifinished part. That is due primarily to the fact that a single casting operation often replaces a whole series of manufacturing operations that take several times as long. The actual rate of production on commercial diecasting machines ranges from around 600 cycles per hour to as few as 20 cycles per hour for large and complex parts such as engine blocks.

Secondary operations on diecastings are usually so simple (drilling, reaming, tapping, and belt-sanding are among the commonest) that they often can be performed at a far higher speed than the primary casting operation. For the jobber, therefore, it is seldom practicable to cut down handling and storage by carrying out secondary operations in sequence immediately the castings leave the diecasting machine. This would mean slowing everything up to the speed of the latter.

Though some jobbers successfully have overcome the problem in a few selected long-run jobs by grouping the equipment for two or three operations in the sequence so that they can be carried out by a single operator, the majority of diecastings still have to be handled on a batch basis. This requires much storage space and several interoperation handlings, as well as complicated production schedules. A workable alternative system has not been easy to find.

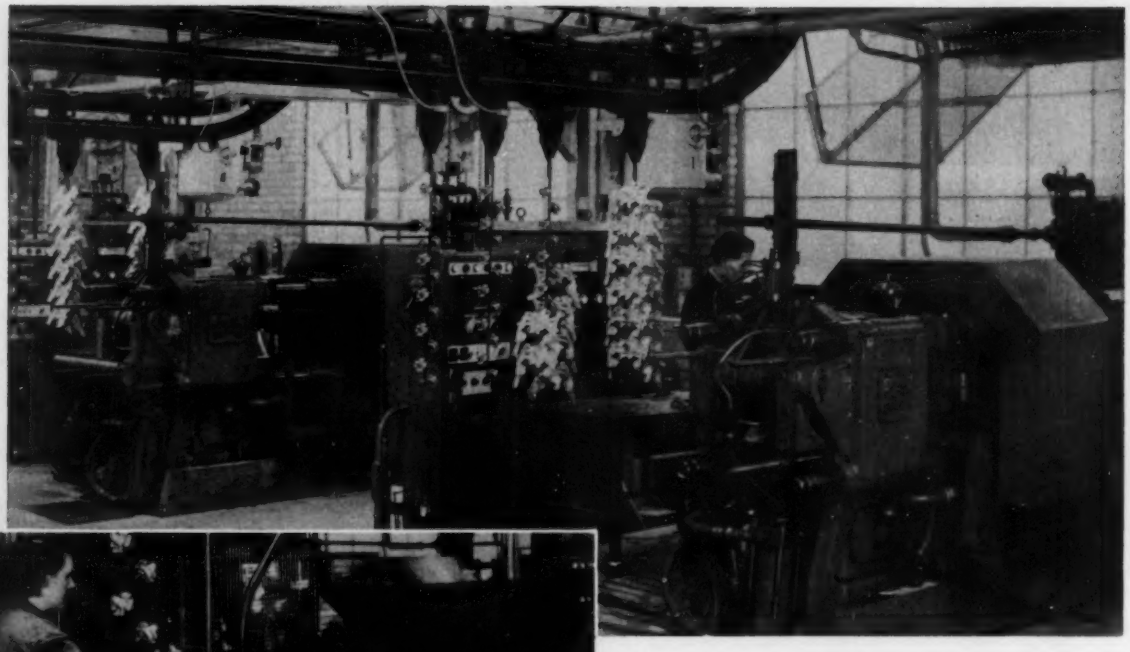
Successful System—The successful flow production system at Wolverhampton Die Casting Co. has been operating for more than three years. It embodies sufficient flexibility to fit diecasting requirements. The company is the largest producer of zinc alloy diecastings in Europe, using upwards of 10,000 tons of zinc per year to produce more than one hundred million diecastings.

The company is an old, established one, and a large part of the production still is handled by conventional batch methods, but between 20 and 25 per cent of production has been turned over to in-line processing. This production is concentrated in a new diecasting shop. The changeover has reduced handling costs and increased production per machine, per worker, and per unit of floor area employed.

In the Wolverhampton installation, elimination of materials handling begins at the melting pot. The production unit consists of eight diecasting machines, each with a built-in low frequency induction furnace. All eight holding furnaces are connected by a heated launder system to two low frequency melting furnaces of 60 kw rating. Each has a throughput of 1,350 lb of zinc per hour. As no iron melting pots are required, no iron can be picked up by the melt, and dross formation is negligible.

The launders connecting the melting furnaces with the machines are of sheet steel lined with channel-form refractory blocks. They are covered by hinged lids with built-in resistance heaters. Normally, these have only to prevent a drop in the temperature of the molten metal in transit, but they are powerful enough to melt metal solidified in the channels if necessary. The launders are dimensioned to allow a maximum rise and fall of metal level amounting to about 4 in., but in practice the variation is seldom much above an inch.

Hold Even Temperature—Laund-



A chain conveyor setup carries diecastings to storage. Here, work-carriers wait near a machine until they're loaded. Then the operator will engage them to the conveyor

Castings are loaded into trimming presses by hand. Trimmed parts are shown riding a small conveyor and a larger one which carry them to subsequent machining stations

er feeding virtually has eliminated temperature fluctuation in the holding furnaces, so that production is never interrupted by frozen nozzles, chilled or overheated metal, or in a too-great fall in metal level. This is reflected in a high rate of production and, equally important, in the maintenance of a high standard of casting quality. Because production is not interrupted, the operator can maintain an even tempo right through the shift; die temperature does not tend to fluctuate, and hardware finish diecastings are produced consistently.

Above each machine, and extending across the shop, is an individual work conveyor 389 ft long. As castings are taken from the die, they are placed directly upon the conveyor, which consists of an endless chain moving continuously on a fixed trackway. The latter forms a guide and housing for the chain and is equipped with hanging work-carriers running on rollers. These can be engaged with the driving chain by a latching device.

On each carrier are twelve projecting arms, slanted upwards. Each arm terminates in a conical diecast boss which conforms in shape to the standard internal taper of the sprue on the spray of diecastings.

A solenoid-actuated stop adjacent to the machine causes the work-carrier to idle while the operator loads it with twelve sprays of castings.

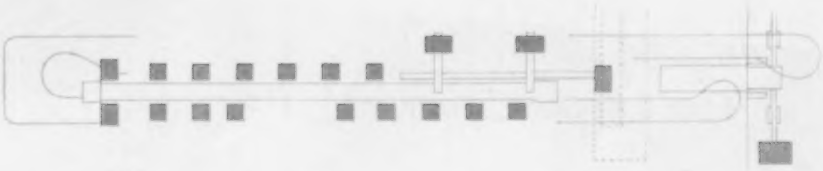
He then pushes a button engaging the carrier with the driving chain, and the work is carried into a storage loop in the roof where it is automatically disengaged from the chain. This storage loop is the key to the successful operation of the system.

Get Castings When Needed — Work in the storage loop, which has a capacity of over 2000 sprays of castings, can be brought down to shop level at the trimming station at the touch of a button. The trimming operation, which is appreciably faster than casting, can be carried out at optimum speed and without hold-ups irrespective of the rate of diecasting machine production.

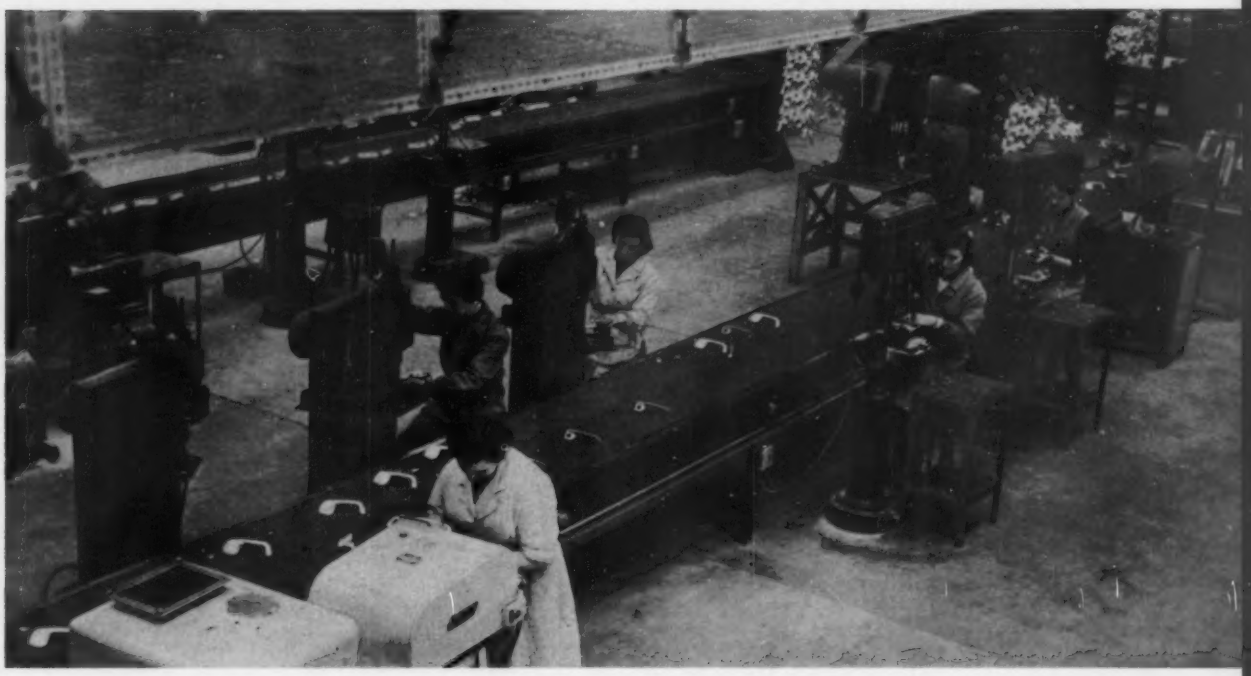
In practice, a buffer stock of castings always is available, because the diecasting machines work on a three-shift basis while the trimming and other secondary operations are performed only during the day.

Trimming is done on light duty hydraulic presses, using drop-through dies whenever practicable. Castings are loaded by hand into the tool. The trimmed parts fall through to a small belt conveyor, and the runner metal and flash

Permanent stations for deburring, drilling, and tapping are provided along the conveyor. When necessary, temporary stations for other operations can be used



Workers handle the parts carefully because many are to be plated. If one surface on castings is critical, the workers always place that side up on the fabric conveyor



are discharged down a chute onto a wire conveyor running in a corridor beneath the floor of the shop. The corridor is 6 ft wide and 7 ft high, and the length of the scrap metal conveyor is 137 ft. In addition to the conveyor, the corridor houses all services required by the diecasting machines. This greatly facilitates inspection and maintenance.

Trimmed castings are discharged by the press conveyor to a fabric belt which carries them along to successive machining stations. For the most frequently required operations such as drilling, tapping, and deburring, permanent stations are provided along the conveyors. Additional equipment for specialized operations can be moved into place between these, according to the needs of any particular casting. Special-purpose multioperation machines occasionally are brought into the line for machining complex castings.

Special Handling Needed—Because a majority of the parts being produced have to be plated, particular attention is paid to careful handling by the women who carry out the secondary operations. The fabric-faced belt avoids damage to the castings in transit, and where one surface of a casting is of particular importance the operators at each station replace the parts on the belt with the critical surface upwards after each operation.

At the end of the belt, the castings are placed in trays fitted with shaped divisions to prevent any subsequent damage to the castings' surfaces. This rigorous attention to handling reduces to a minimum the buffing that has to be done before plating.

When the system described was first brought into operation, management thought that only long-running jobs would justify the change-over to line processing. With three years experience, however, flexibility of the system has proved its advantage for processing any diecasting in this way provided that about three full days production is involved.

With this minimum requirement, it is fully economical to change the whole tooling sequence, moving the machining stations around as required. With the storage loop conveyors, machining of one type of casting can continue through diechange and after the next type of casting has gone into production. When the stock is exhausted, the machining line can be retooled while the diecasting machine operator continues to build up a buffer stock of the new component.

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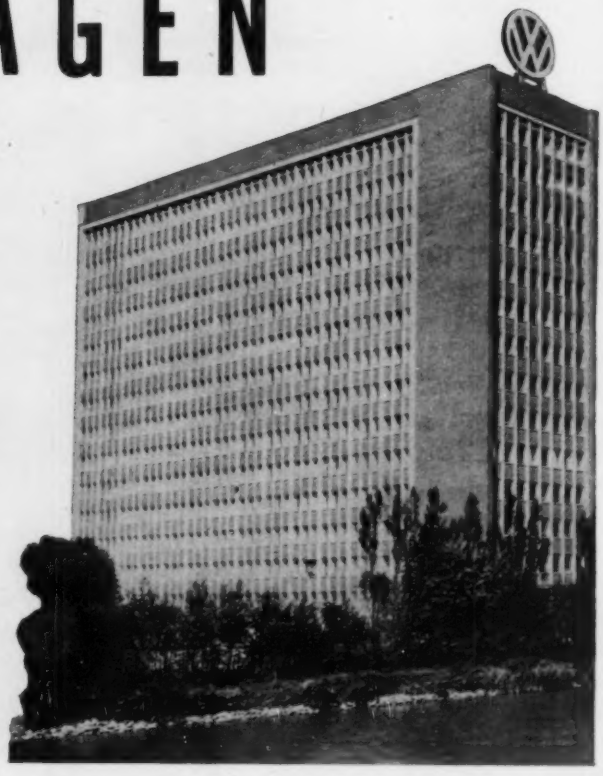
The Success Story of

VOLKSWAGEN



EFFICIENCY IN MANAGEMENT, PRODUCTION AND MARKETING

. . . this is the principal reason for the unusually swift growth of Germany's largest manufacturer. The VW foundry is the world's leading producer of magnesium castings. It also supplies cast aluminum, gray iron, and zinc parts for 4000 vehicles daily

By WILLIAM G. GUDE
Editor

● TWO small-scale models of the main Volkswagen plant stand in the lobby of the company's administration building in Wolfsburg, Germany. One model depicts the bomb-wrecked structure of 1945, when 60 per cent of it was in ruins. The other shows today's modern and vastly larger plant, which is producing 3400 passenger cars daily.

These two models portray better than any statistics how Volkswagen rose from a pile of rubble to its present rank as Germany's largest manufacturer and the world's fourth largest automotive company.

Last year Volkswagen built 865,858 vehicles and exported 56.5 per cent of them—191,000 to the United States. Production this year is expected to total 1 million units, nearly one-half of all the automotive output of West Germany.

Decentralization—The Wolfsburg plant, employing 37,000 persons, is only one of four VW manufacturing operations in Germany. At Hanover, 50 miles to the west, a plant built in 1955 has 18,000 employees who turn out 600 trucks, buses, and station wagons a day, plus all of the engines for passenger and commercial vehicles.

Front axle assemblies are manufactured at nearby Brunswick by 4000 workers, and a plant at Kassel, 120 miles to the south, has 6500 employees producing spare parts. The latter plant currently is undergoing a major expansion.

Foundry Operations—All Volkswagen castings—totaling nearly 5000 tons a month—are produced in a foundry building with 65,000 sq ft of floor area at the Wolfsburg Works. A modern and well mechanized operation, it is not conveniently situated with respect to the Hanover plant, to which all engine castings must be shipped, and removal of the foundry to Hanover is being planned.

The foundry has 1050 employees on three 8-hour shifts, five days a week. The main plant works two 8-hour shifts a day, 40 hours a week.

Although foundry practice was the manufacturing operation of primary interest to the author during a recent visit to the Volkswagen plants, the dramatic history and

Worker removes a diecast magnesium crankcase half from a machine. Watching are the author; William Schick VW assistant production manager; William Becker, assistant manager of the foundry

Headquarters building, at left, and main plant of the Volkswagenwerk in Wolfsburg, West Germany. The Mittleland Canal separates plant and city

rapid expansion of the company comprise a story worth telling.

Many superlatives have been used to describe the rags-to-riches experience of Volkswagen. Certainly no more unusual circumstances ever marked the inception of an industrial organization or its subsequent development than those attending this manufacturer. At the same time, there are sound business reasons for its success, and their details are both interesting and enlightening.

How It Started—The idea of a low-priced Volkswagen ("People's Car") was conceived a number of years before Hitler picked up the idea and attempted to make political capital of it. This dream, translated into actual drawings, was that of the automotive design genius Ferdinand Porsche. The time was the early 1930s.

Dr. Porsche's designs subsequently became the basis for a car which the government decided was to be mass produced. The only two German companies capable of handling the task, however, were American controlled. Because Hitler insisted that the work be financed by German capital, the Society for the Development of the Volkswagen was founded by funds provided by the Labor Front.

On May 26, 1938, the foundation stone of the Volkswagenwerk was laid at Wolfsburg, and in September work was started on the first buildings of the town.

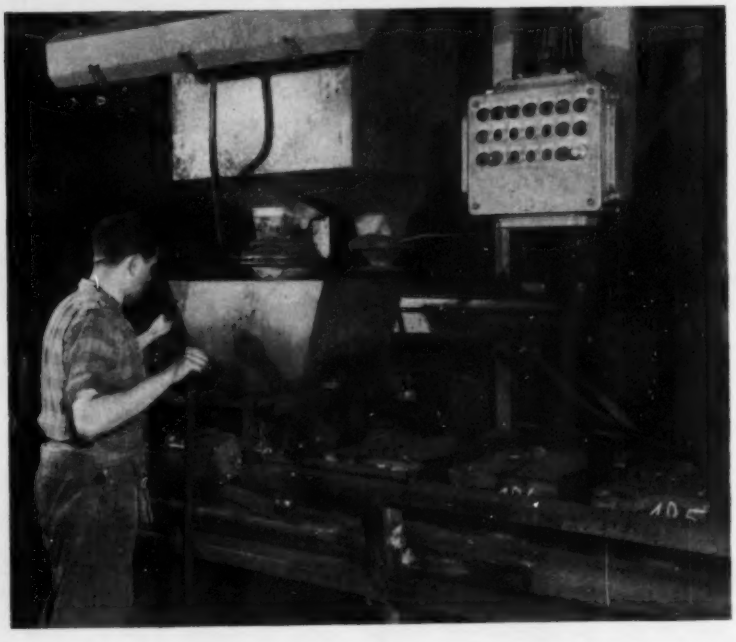
At that time Wolfsburg was not a city. It is in the state of Lower Saxony, in the northern part of Germany, and in the center of an agricultural rather than an industrial community. A small settlement of 150 people before 1938, for years it was noted primarily for its 600-year-old castle—the Wolfsburg (the VW emblem of a wolf and castle was a natural)—and a 13th century church, St. Anne's. The castle, incidentally, today belongs to the state and is used as a refugee center for people fleeing from East Germany, 8 miles to the east.

The selection of Wolfsburg as a plant site was based on the desire to industrialize a primarily agricultural area and on the fact that to the west there seemed to be no room for the factory and its town. An

Making shell molds for gray iron cylinders. The multiple-station machines receive coated sand from carrier traveling on monorail

Pouring the gray iron cylinders. Metal reservoir travels at same rate as the molds. Iron is melted in 6-ton electric furnaces

Backup shot is poured from overhead hopper into each flask containing two shell molds. Flasks are moved by car conveyor



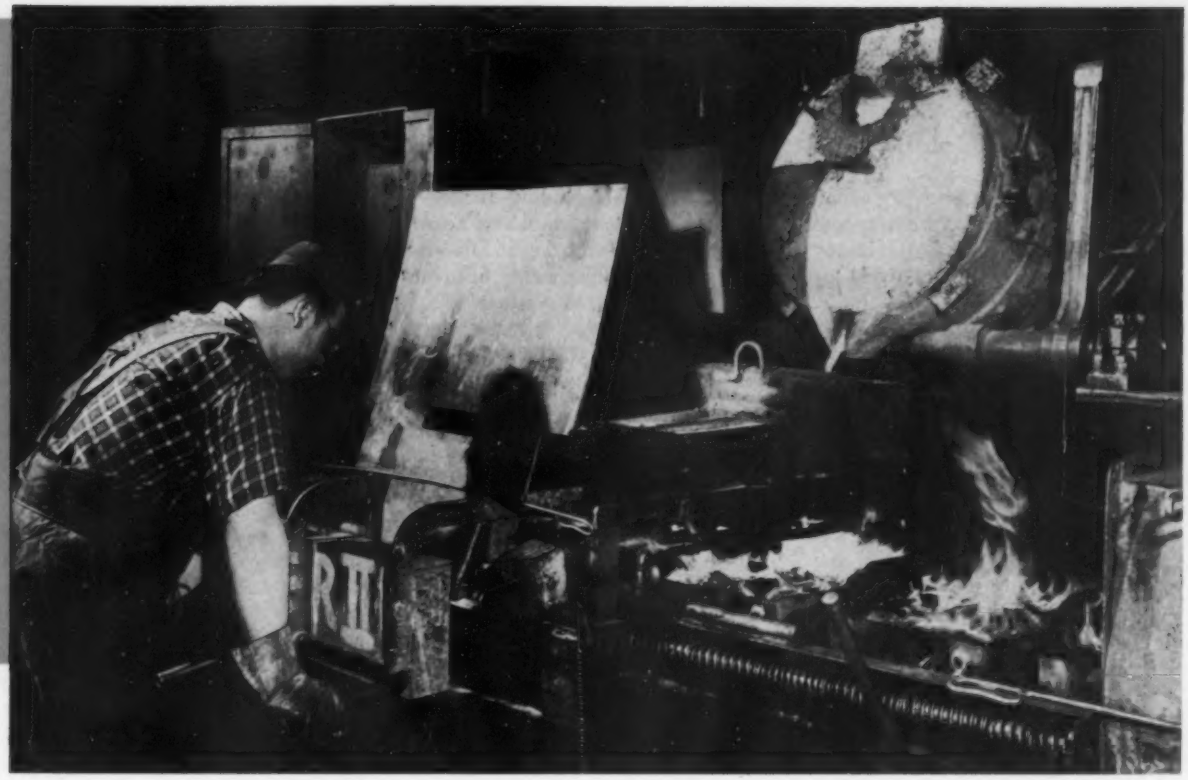
avenue for heavy traffic is provided by the Mittleland Canal—a waterway which separates plant and city and extends westward to the Ruhr—but the anticipated extension of the Autobahn (the world's first turnpike) to Wolfsburg never was completed. As a result, practically all cars are shipped by train; a drive-away of 3400 vehicles daily from Wolfsburg, such as is common practice from Detroit, would hopelessly clog the nearby roads. Only VW dealers within 100 miles of Wolfsburg drive home their cars.

Special double-decked railroad flat cars are used to transport most of the factory's output. A train of 25 cars, ten autos per car, can be loaded in an hour.

Came the War—World War II, of course, killed plans for building both the new city of Wolfsburg and the People's Car. By the time the factory began production in 1940 the car had been modified to a military vehicle, and later an amphibious model was added. During the war 55,000 military and 15,000 amphibious VWs were built. The plant, manned largely by forced labor from almost every country Germany was fighting, also produced other military materiel and became a natural target for Allied bombers.

Invasion forces found a mass of ruins in 1945. The British, in charge of that sector, approved a suggestion by VW engineers to resume operations, and before the end of the year, 1785 cars had been built. With the end of the war, however, the plant was turned back to the Germans because private industry of the Allied countries was not interested in attempting to market this new type of auto.

Production sputtered during the immediate postwar period, but started to climb steadily and rapidly beginning in 1948. It is more than coincidence that this expansion began with the appointment of Heinrich Nordhoff as general manager of the plant. In their selection, the British, who still held legal trust in the factory, picked a man with sales and production experience acquired in both Europe and America. He had joined the



Opel works shortly after it was bought by General Motors in 1929 and in 1940 became head of its new truck plant in Brandenburg, then the largest and most modern in Europe.

A New Approach—In his post-war capacity, Dr. Nordhoff faced a monumental task. American manufacturers had demonstrated that the low-priced quality car necessary to capture a large market was dependent on mass production. In Europe, however, the relatively small domestic market restricted production and boosted costs. The obvious solution to this problem for Volkswagen was to provide a low-cost, mass-produced car that would sell widely in overseas markets. Concentration on one standard model would help to achieve low costs.

Obstacles faced in carrying out this program were formidable. The flow of Marshall-Aid funds did not extend to Wolfsburg, and money for new machinery had to come largely from VW exports to hard-currency countries. Technical problems arose in adapting Dr. Porsche's creation to mass-production technique. Adequate service and dealer representation were required to promote and back up export sales (today there are more than 5000 VW service agencies throughout most of the world).

Emphasis was placed on production, and output rose from 19,000 cars in 1948 to 46,000 in 1949. It topped 100,000 in 1951, and in 1955 the 1 millionth vehicle came off the line. Constant expansion of plant capacity necessarily accompanied the rise in sales; since 1948 Volkswagen has invested $400 million in its growth. During the last three years alone, more than $50 million was spent for American machinery.

Plus Factors — Several factors other than the quality reputation of its product have contributed to Volkswagen's success:

1. Until a year ago, the company had no stockholders to question plowing back profits into an expanding plant. Previously the Volkswagenwerk was administrated on behalf of the West German government by the State of Lower Saxony, which was not entitled to any profits.

Today it is a private company, with 60 per cent of its stock held by 1½ million German residents. The remaining 40 per cent is shared equally by the federal government and Lower Saxony, which will contribute their dividends, as well as proceeds from the public stock issue, to a foundation for the promotion of science and technology.

2. Director Nordhoff proved to be an inspirational leader, and, by infecting the growing number of workers (many from East Germany) with his belief in success, created a morale and pride in accomplishment which have been of inestimable value. Good communication between management and workers has been a key factor in creating this attitude.

Except for those of Ruhr miners, wages of VW employees are the highest in Germany, and Wolfsburg remains a one-industry city.

3. Concentration on one model has avoided the heavy retooling and engineering expense of frequent design changes. A static design, however, is not a fixation with the company. A few months ago the new VW-1500 was unveiled, and

additional plant capacity now is being provided for its production. It is about 6 in. longer and about 30 per cent higher in price than the standard model, which it will supplement—but not replace—in European markets.

Volkswagen continues to supply chassis to Karmann's, the autobody builder in Osnabruck, Germany, which assembles the relatively expensive Karmann Ghia.

The Engine—Although numerous modifications have been made in the Volkswagen engine during the last 30 years, essentially it follows Dr. Porsche's original concept —a four-cylinder, four-cycle, air-cooled type, with two pairs of cylinders horizontally opposed. With a bore of 3.03 in. and stroke of 2.52 in., it delivers 40 hp at 3900 rpm.

Rear mounting of the 187-lb engine puts a premium on light weight and dictates extensive use of magnesium and aluminum castings. As a result, the Volkswagen foundry has become the world's largest producer of magnesium castings. It pours about 1800 tons monthly; by contrast, shipments of finished castings by all magnesium foundries of the United States averaged less than 1000 tons a month last year.

Major cast parts of the engine add up to about 37½ lb of magnesium, 31 lb of gray iron and 22 lb of aluminum. All castings are made in shell molds, permanent molds, or diecasting machines. Melting is done electrically in arc and induction furnaces. Electricity for the foundry and other manufacturing plants (including a heavy load for the latter's welding operations) is supplied by a 165,000-kw power plant. This facility also furnishes heat, light, and power to residents of Wolfsburg. Incidentally, one-third of the 1000 tons of coal consumed daily comes from the United States.

Magnesium castings are used for the crankcase and transmission housing of the passenger car; the truck transmission housing is a gray iron casting. Finned cylinders and camshafts also are gray iron. Cylinder heads are cast aluminum. Current production requires pouring of 1600 tons of gray iron and 1300 tons of aluminum monthly. In addition to the aluminum, gray iron, and magnesium operations, a half-dozen small parts are diecast of zinc.

Cylinder Production—The gray iron cylinders, each weighing about 5½ lb, are poured in shell molds, a casting practice adopted about ten years ago. Molds are made by the dump-box process on rotating table machines. Sand is coated with resin at a mixer at one end of the line of molding machines and is dispensed to individual molding machine hoppers by an overhead carrier traveling on a monorail, as shown in an accompanying illustration. Each shell mold includes cavities for two cylinders, and the parting line is formed vertically.

After the mold halves have been pasted together, two molds are placed vertically in a flask which is moved by car conveyor past an overhead hopper and filled with backup shot. The conveyor then proceeds to a pouring station. Molds are poured from a metal reservoir traveling at the same rate as the conveyor. This reservoir is supplied by a transfer ladle which receives its metal from 6-ton capacity electric arc furnaces. Furnace charges consist of 50 per cent pig iron, 25 per cent iron scrap, and 25 per cent compressed steel bundles.

At the shakeout, castings are removed while sand and backup shot drop below the floor for separation and reuse of the shot. The cylinders then are moved by chain conveyor through a blast machine for cleaning and subsequent inspection.

One section of the aluminum permanent mold department. Cylinder heads, comprising the principal aluminum castings, are made with shell cores

Magnesium Diecasting—In recent years the company has converted production of the principal magnesium castings from permanent molds to diecasting machines. The largest casting is the split crankcase, the two halves of which weigh about 21 lb machined. These halves are machined in pairs to close tolerances, and replacement, if necessary, must be made in pairs.

Largest diecasting machines in service are of 1000 and 800-ton capacity. Other units include 24 machines of 630-ton capacity, 3 of 600 tons, 7 of 200 tons—all for casting magnesium—6 of 100 tons for either aluminum or magnesium, 2 of 80 tons for zinc diecastings, and a 10-ton machine also for zinc parts.

Second largest magnesium diecasting is the passenger car transmission housing, which also is made in pairs and has a total weight of about 15 lb. Other diecast magnesium parts are smaller miscellaneous items.

Magnesium is melted in twenty-four 1300-lb capacity induction furnaces, then transferred to holding furnaces adjacent to the diecasting machines. Overhead conveyors transfer castings from the machines to the finishing department.

Aluminum Castings—The 9½-lb cylinder heads are made of aluminum and are cast in permanent molds. Holding furnaces are supplied by seven 3100-lb capacity melting furnaces. Five-man teams handle eight permanent molds, which are poured through two sprues from double-lip hand ladles. Cores used in the permanent molds are shell type. Overhead conveyors move castings from the permanent mold foundry to the cleaning room.

A reserve bank of permanent molds is held under flame near the aluminum castings production line so that they will be at the desired temperature when replacements are needed on the machines.

Engine castings destined for the manufacturing plant in Hanover are packed in large wire-mesh containers for shipment.

The City — Wolfsburg, which grew from a handful of inhabitants to a city of more than 60,000 citizens, is part of the Volkswagen story. The majority of its people are under 30 years old, and it has more children and autos per capita than any other Germany city. Most of the cost of building the city came, directly or through municipal tax, from the Volkswagenwerk's profits. It is thoroughly modern because it was planned that way and built largely within a span of a few years.

If its citizens worry over their complete dependence on one industry and one company, the fact is not evident; apparently they share the same spirit which sparked the progress of the organization responsible for the city's creation.

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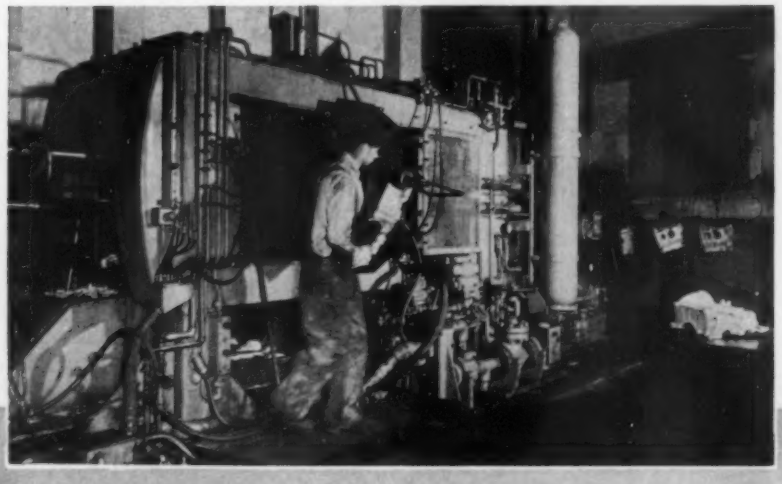
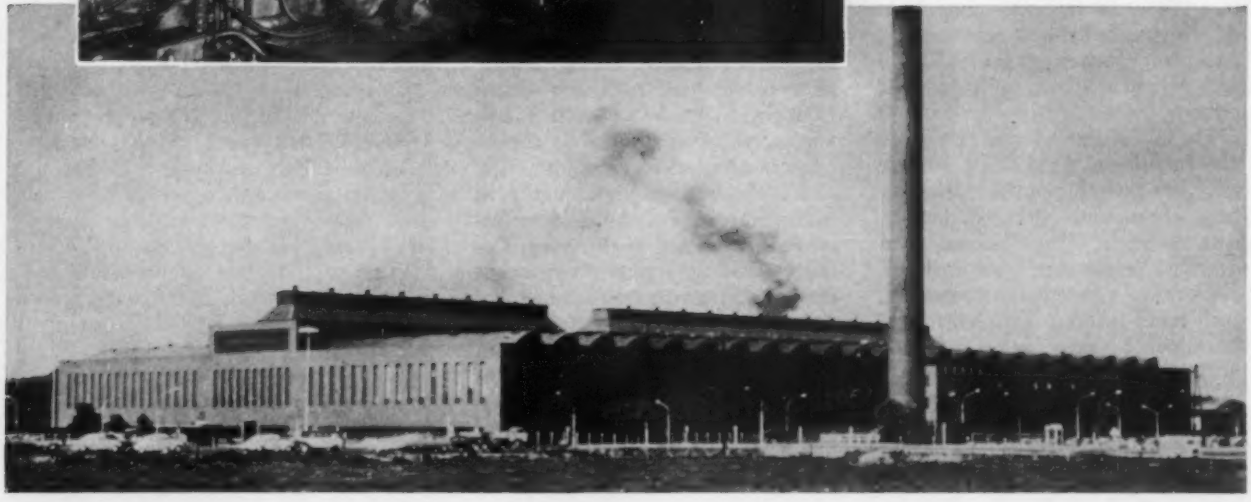


Diecastings are carried from machine area to finishing department by chain conveyor



Exterior view of the Volkswagen foundry. It is a separate building at the Wolfsburg plant

Slash Scrap!

By HARRY S. KINDLE JR.
Manager, Quality Control
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A Castings User Looks at

QUALITY CONTROL

The expense of installing an effective quality control system will be returned several times over through reduced scrap and an improved competitive position. Such a system requires a careful plan of inspection coverage, execution of the plan, and conscientious follow-up

● ANNUALLY, our company buys 18,000 to 20,000 tons of castings from approximately 35 foundries at a total cost of about $20 million. This tonnage represents about 4 million individual castings in sizes ranging from 0.2 to 1500 lb and is made up of 1400 different parts.

These castings include alloyed and unalloyed gray iron, ductile iron, ferritic and pearlitic malleable iron, aluminum, Ni-Resist, bronze, and Stellite. They include sand castings, permanent mold castings, diecastings, investment castings, shell mold castings, and centrifugal castings.

Quality Is a Must—It's obvious that a diesel engine has demanding requirements for quality. The cost of downtime for repairs probably is higher in products using diesel engines than almost anywhere else in industry. For example, if a simple part fails on a diesel engine in a shovel used to load a dozen off-highway trucks, a million dollars worth of equipment is useless until repairs are made.

We also require high quality in castings because of the need to improve manufacturing efficiency. Defective castings require rearrangement of production schedules, downtime on machines, and expensive expediting. Downtime is even more critical today because of increased use of automated machinery, which requires a steady flow of high-quality materials to prevent downtime.

Casting rejections cost us $140,000 in the direct cost of machining defective castings last year. This amount is, however, only a small part of the real cost because the shortages and disruptions of schedules cost many times more.

In addition to this cost, we will have returned to foundry suppliers about $857,000 worth of defective castings. This expense to the foundries also is only a part of their total cost of defective quality. It is necessary to add to this figure the cost of handling the material and shipping it and each foundry's internal scrap cost. Quality control expenses will be returned several times over through reduced scrap and an improved competitive position.

Causes for Rejection—Three major factors cause rejections of the

This paper was presented at the Foundry Marketing Conference sponsored by Walter Gerlinger Inc. and International Minerals & Chemical Corp., in Milwaukee, Jan. 17.

castings we use. They are internal defects, 61 per cent of the rejections; visual defects, 25 per cent; and dimensional discrepancies, 12 per cent. The remaining 2 per cent are miscellaneous defects.

It is reasonable to expect that modern quality control techniques can reduce internal defects by 50 per cent, visual defects by 80 per cent, and dimensional defects by 80 per cent. This improvement would reduce the direct loss to foundries from $857,000 to $325,000 and decrease the value of rejected castings from 4.28 per cent to 1.62 per cent of casting purchases. Foundries which can meet this challenge will enjoy an enormous sales advantage.

Obviously, our demands for better quality will not be met if we simply notify our foundry sources and wait for the improvement to happen. We need to have a look at the basic purchaser-supplier relationship and to develop a constructive program to improve quality on a co-operative basis. I believe that this goal can be accomplished with substantial benefits to both parties.

An important index of quality performance is the percentage of returns by other customers who use a similar casting with comparable quality requirements. Information of this nature would be valuable during the first sales contact. As a business relationship progresses, it is our practice to have an evaluation team visit potential suppliers. This team consists of representatives from purchasing, engineering, and quality control. Naturally, during each evaluation visit, we appreciate receiving full information about the personnel, facilities, and techniques devoted to quality control.

The foundry's diligence in reducing internal scrap is of interest to us because effectiveness in this area means lower costs in the foundry and lower prices to the customer. This exchange of information will create a better understanding of our quality requirements and the quality capability of each potential foundry supplier. It also will avoid misunderstandings about quality standards in the future.

Purchaser-Supplier Relationship—In examining the proper purchaser-supplier relationship, the purchaser must recognize problems facing the supplier. We realize, for example, that the basic nature of the foundry operation increases the difficulty of controlling quality. Castings are subject to more human variations from one part to another than most other products, and the types of defects encountered in castings often are internal and are difficult to detect economically.

On the other hand, I believe it is important for the casting supplier to understand the requirements of their customers and to recognize some basic concepts of quality control to arrive at the proper purchaser-supplier relationship. One basic principle is that quality should be controlled at the source—in the foundry of the supplier. Controls established at later points permit too many defective parts to be created before the defects are detected and corrective measures taken. The foundry smart enough to set up and maintain an effective quality control system could take advantage of it to sell its services.

Another important aspect of the relationship between foundries and their customers is the understanding by the foundry that in accepting an order it obligates itself to make good quality parts in accordance with blueprints and specifications. Too often, when we run into trouble, we find that a foundry knew when it studied the job that it couldn't make an acceptable part.

At the same time customers owe it to their suppliers not to seek rush quotes which prevent careful study of the job. They also should give prompt, clear-cut decisions when the supplier asks for changes that will enable him to do the job. The customer also owes it to his supplier to define as explicitly as possible the quality levels expected, and he should not make abrupt shifts in quality requirements without adequate notice and planning.

Elements of Quality Control—Most foundries are co-operative in attempting to eliminate quality problems, but too few have any organized program to prevent such problems from originating. What I am suggesting is just as much a change in techniques of quality control as in attitude toward quality.

Effective quality control requires that each foundry assign some individual clear-cut responsibility for the quality of material shipped. Ideally, the production organization should be responsible for quality, and the quality control organization should be responsible for detecting rejects and advising production of problem areas which require correction. The manager of quality control should look at these three basic attributes of a good system:

1. *A Careful Plan of Inspection Coverage*—This plan takes into consideration the total amount of economically feasible inspection coverage. It also deals with the characteristics to be inspected,

A Modern Quality Control System

PLANNING
. . . to develop systematic inspection coverage that will assure effective quality control.

EXECUTION
. . . to inspect in accordance with the established plan.

FOLLOW-UP
. . . to measure results to improve the plan and its execution continually and to identify and solve quality problems rapidly and economically.

It's a basic principle that quality should be controlled at the source—in the foundry of the supplier

methods to be used; points of inspection in the sequence of production operations; statistical plans to be used; use of quality level reports, process capability studies, and control charts; and many other features.

This planning phase also should include development of procedures for deciding what to do with nonconforming material. Plans made at this stage need not be too formal, but all bases should be covered so that the foundry will control quality instead of letting it control the foundry.

2. *Execution of Plans Developed* —Inspectors should be well trained in the procedures they should follow and should be instructed as to points of inspection, gages to be used, records, standards for acceptance or rejection, and what to do in case they run into trouble. It is essential at this stage to provide management with simple but informative reports of quality levels, quality trends, and quality problems.

3. *The Follow-Up* — This step consists of measuring quality performance and establishing prompt action to eliminate individual quality problems and to generate a continuous improvement in quality capability and quality control capability. It is important to distinguish between the ability of manufacturing to produce acceptable material and the ability of quality control to prevent defective material from reaching the customer.

Rejections identified by the inspection organization are a pretty good measure of manufacturing's quality capability, but they are not a measure of the ability of inspection to detect all defective material. Too often this point is forgotten. If no quality audit is performed to provide a check on inspection capability, the customer is stuck with the job. Too many businesses, including many foundries, still operate with a ragged, inadequate inspection system which operates on the theory that "the customer should find the problems and tell us about them."

A quality control system will save its cost many times over through reduced scrap and competitive benefits

Applying Quality Control—Some of the features which I believe are necessary for a good quality control system in the foundry and should be subjected to this process of planning, execution, and follow-up are these:

1. The first of all new castings produced should be laid out and sectioned to assure conformance to the customer's blueprint before the first sample is submitted to the customer. The early samples also should be used to check on internal soundness of the casting.

2. Foundries should establish controls to see that the best gating and risering methods are developed as rapidly as possible and that these methods are not changed without checking to make sure that casting quality is not lowered thereby.

3. Good laboratory controls of sand mixtures, metal composition, and properties should be provided.

4. Inspection of castings for cleanliness, finish, evidence of cracks, handling damage, and other visible defects should be planned carefully.

5. Dimensions of castings should be checked by gages and fixtures.

6. Sectioning of castings in known trouble areas should be done periodically to check for porosity or other internal defects. This work should be carried out statistically, with consideration of the extent and seriousness of defects.

7. Foundries should be capable of performing nondestructive tests to troubleshoot known and suspected problems and to carry out routine inspections where their use will pay off.

8. There should be a periodic examination of castings and patterns for evidence of wear, core shift, etc., to determine whether pattern repairs are necessary.

9. Gages and other measuring equipment should be checked periodically.

Application of these controls still differs from one foundry to another, depending on the nature of the castings produced and the customer's needs for quality. Consequently, consideration should be given to the extent that they are economically justifiable.

Quality Ratings—We apply a quality rating to each of our suppliers. These ratings range from "A" for high quality to "E" for unacceptable quality performance. The ratings are based on a four-month moving average rejection rate and are brought up-to-date monthly. These quality ratings are given strong consideration by our purchasing department in placing new foundry business. We have switched many castings from one foundry to another because of the inability of the first to produce castings to our quality standards.

We also are planning to use another device to aid purchasing in selecting vendors for high quality performance. When we encounter poor casting quality, we intend to analyze our excessive cost required to use a particular foundry's casting and reduce this extra cost to a unit figure for each casting received of that particular part number. This figure can then be used by purchasing in a direct comparison of quotes between different foundry sources. Their decision can be made in light of knowing exactly how much extra it will cost us to use the product of the foundry with the poorest quality record.

I sincerely believe that if foundries co-operate wholeheartedly by installing effective quality control systems, they will be pleasantly surprised at the savings obtained, over and above the competitive benefits obtained by producing higher quality.

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RISERING

Shell Mold Castings

In this article, the 22nd in our gating and risering series, the authors recommend procedures for risering of shell mold castings. There are some similarities to green sand molding practices

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● ONE of the most important contributions to the risering of metal castings has resulted from the work of Chvorinov[3] and his observation that solidification time of sand castings will be proportional to the square of the volume to surface area ratio of the casting.

Equation 4 $$\left(\frac{V}{SA}\right)^2 = Ct$$

where: V = casting volume.
SA = Casting surface area.
t = solidification time.
C = proportionality constant dependent on thermal properties of the metal and thermal diffusivity of the mold.

This relationship, although originally developed for infinite plates, has been shown to hold true for other sand castings of similar shapes in steel. It also can be used to predict the solidification time of other metals. Two assumptions are contained in the equation: One, the interface temperature between the mold and the metal is relatively constant. Two, the thermal properties of the mold and metal also are constant.

The first assumption is valid in the case of mold materials wherein the casting has a reasonably long solidification time, but in metal chill molds the solidification time departs from that predicted by the above equation because the mold-metal interface temperature does vary over a wide range. The second assumption—constancy of metal and mold thermal properties—never is upheld completely, but usually is valid for engineering purposes.

The applicability of the equation is checked by plotting the log of solidification time versus the log of the volume/surface area ratio for a number of castings. The points should fall on a straight line whose slope is two, as the following simple differentiation indicates:

Equation 5 $$\left(\frac{V}{SA}\right)^2 = Ct$$

$$2 \log \frac{V}{SA} = \log C \log t$$

$$2d \log \frac{V}{SA} = 0 + d \log t$$

$$\frac{d \log t}{d \log \frac{V}{SA}} = 2 \text{ (slope)}$$

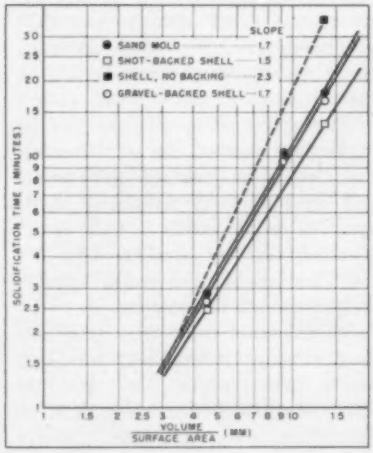

Fig. 1—Solidification time vs volume/surface area ratio for aluminum plate castings

If refractories other than sand are employed as a mold medium, a log-log plot of the above type still should result in a straight line parallel to the one developed for solidification in sand. If the substitute refractory is a chill with respect to sand, the line will fall below the original curve; if it is an insulator with respect to sand, the line will lie above the curve for sand molds. At any given V/SA ratio, solidification time in the alternate refractory will be directly proportional to that in a sand mold.

Plot Data — With this background in mind, recent data on solidification time of plate castings[4] poured in sand and shell molds were plotted in Fig. 1, 2, and 3. Fig. 1 is for aluminum and Fig. 2

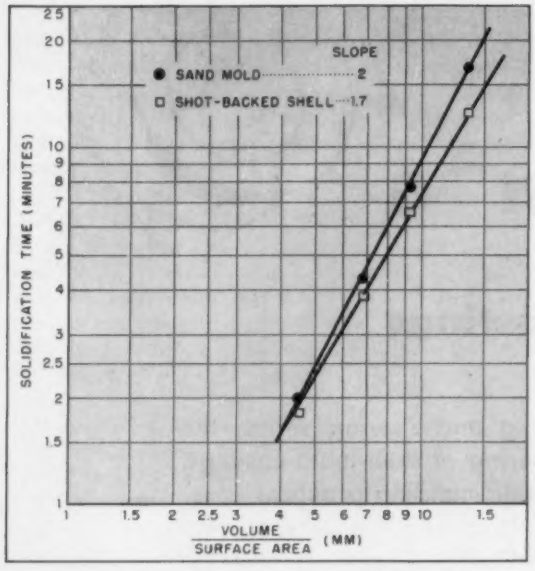

Fig. 2—This plot is for high carbon equivalent, nodular iron plate castings

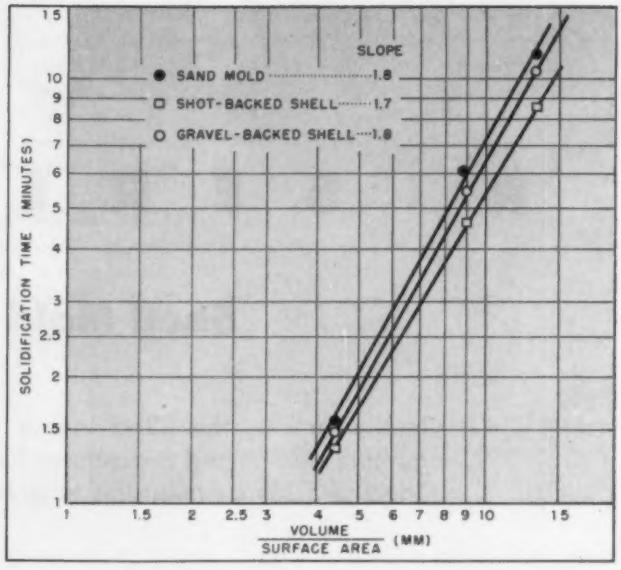

Fig. 3—Casting gun metal plates in sand and shell molds resulted in these plots

and 3 are for nodular iron and gunmetal, respectively. Log of solidification time is plotted against the log of volume-surface area ratio for the plate castings poured in sand, shell molds backed with gravel, and shell molds backed with shot. Best straight lines were drawn through available data points.

In all three figures, solidification in a sand mold yields a line having a slope approximately equal to two, while the shell mold lines depart somewhat from this theoretically desirable slope. The departure from ideal behavior probably is due to variations in the proportionality constant of the basic equation. Over-all thermal properties of the shell mold are dependent on casting thickness or V/SA ratio since the mold actually is a composite of shell and backup.

At short solidification times or small casting thicknesses, mold thermal properties approximate those of a sand mold, and in thicker castings, the over-all shell mold thermal properties (specifically, the thermal diffusivity) are modified by the backup material. Such changes cause a variation in the proportionality constant. The preceding rationalization conforms with observations and the graphs.

Effect of Backup—Freezing time of thin castings is independent of shell mold backup and is comparable to sand mold solidification behavior. Freezing time of thick castings in gravel-backed shell molds is slightly shorter than the freezing time in sand molds, and shot-backed shells definitely exhibit a chill effect when compared to sand molds.

In view of current shell mold practice, it is interesting to examine the effect of no backup. In Fig. 1, the dashed line depicts solidification of aluminum in a shell without backup. In this case the line is lightly sketched, because it was constructed on the basis of one experimental point and the fact that solidification times tend to converge in shell and sand molds at short times and small V/SA ratios.

If that curve is assumed to be reasonably correct, the solidification time at large casting thicknesses will be longer in unbacked shells than in sand molds. This trend is reinforced by similar data for solidification of steel in shell molds and by practical observations.

Solidification time not only affects risering procedures, but also has a great bearing on the mechanical properties of many metals.[5] Properties can decrease rapidly with a moderate increase in solidification time. In comparing sand mold castings and shell mold castings, differences in mechanical properties that have been reported[6, 7] undoubtedly are due to minor changes in solidification time between the sand-cast and the shell-cast metal.

Mechanical properties conform with solidification time. Shot-backed shells yield slightly higher properties than sand molds at equal casting thickness, and the properties of castings from unbacked shells tend to be somewhat lower. This is especially true with nonferrous metals that are sensitive to solidification time. The above trend will not be as pronounced in steel and nodular iron castings, for they are comparatively insensitive to solidification time.

The variation in solidification time between sand and shell molds is not great enough to change feeding distance in a casting. Analysis thus far indicates that the established feeding distance rules apply. The research report[8] on this topic states that: "It may be assumed that the formulas developed for feeding range in sand cast steel bars, joined sections, padded sections, and chilled sections are applicable to shell mold castings without modification."

Suggested Procedures—The foregoing discussion leads to the use of certain shell mold procedures that have an over-all beneficial effect on casting quality. These recommended procedures are as follows:

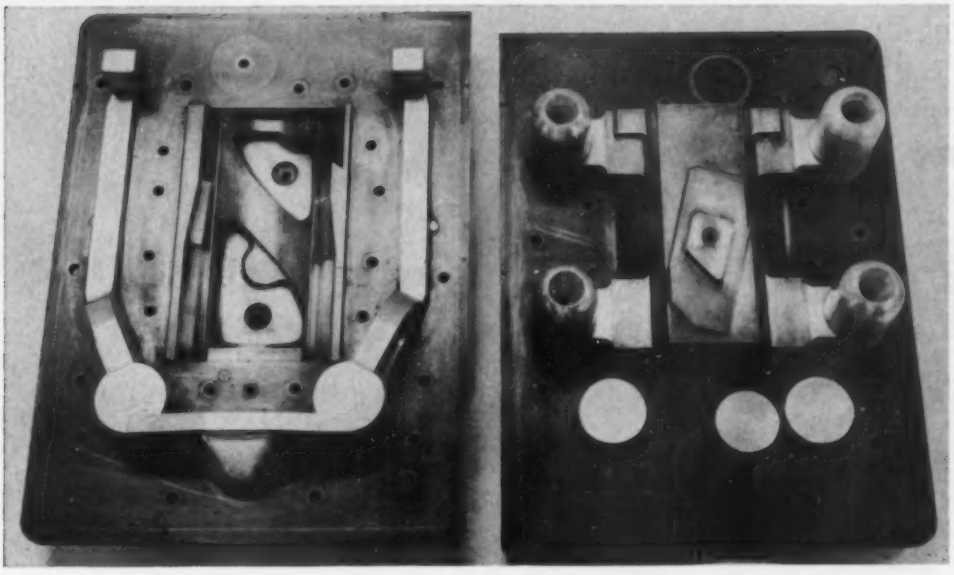

Fig. 4—A typical example of the blind riser is shown in this view of patterns for making shell molds for a rocket slide casting

1. Whenever possible, shell mold risers are not backed in order to take advantage of the resulting slow solidification.

2. Procedures employed for calculating riser dimensions in sand molds also are applicable to unbacked shell molds.

3. Castings poured in shot-backed shell molds can require risers slightly larger than those required in conventional sand molding because the slope of the log solidification time versus log V/SA is less than two. A shot-backed shell mold riser will freeze in less time than a sand-molded riser, and the cast section being fed by the riser can freeze—particularly in thin sections—in the same time as a sand-molded casting.

Such a situation could lead to inadequate risers if they are calculated on the basis of risering methods for sand molds. Conversely, pouring into unbacked shell molds can lead to long solidification time versus log V/SA plots of slope greater than two. Therefore, risers will be more than adequate if calculated from data originally developed in connection with sand molds.

4. Good risering efficiency is obtained when the shell mold is shot-backed around the casting cavity while backing is not employed around the risers.

5. The procedure suggested in No. 4 above can result in a decrease in riser dimensions. Reference to Fig. 1 will show that the freezing time of metal poured into a 2-in.-diam, 3-in.-high, shot-backed casting cavity will take no longer to freeze than a 1.6-in.-diam, 2.4-in.-high cylinder cast in an unbacked shell.

This represents a volume decrease of approximately 50 per cent in cylinder size and easily could be translated into a significant decrease in riser dimensions, provided that the graph for the unbacked shell is reasonably correct. A similar comparison between unbacked shells and shells backed with insulating material would be appropriate but such information is not available at present.

6. Metals that are section sensitive should be poured into shot-backed shell molds to decrease solidification time and to increase mechanical properties. This will be helpful especially with thicker casting sections.

Use of a Blind Riser—Implementation of these thoughts is most practical when the blind riser is being used. Shot and other backup materials are prevented from entering the riser cavity. This advantage, the inability to use open risers in vertical pouring practice, and the natural ease of blind riser placement on the pattern assembly combine to preclude large-scale use of the open type of riser.

A typical example of the blind riser is shown in the rocket slide pattern of Fig. 4. Conventional sand practice would require the insertion of a graphite rod or a core into the riser top to keep it open to the atmosphere. Here the conical indentation on the riser pattern produces a protrusion of the shell into the riser cavity. Thus the core or graphite rod is eliminated.

The same result is obtained in vertical gating by a slot or a V-groove. Either will create the required hot spot that allows the desired atmospheric pressure within the riser. The castings generally are gated with a runner from the sprue through the risers so that the risers receive the hottest metal to create favorable directional solidification from the castings to the risers.

REFERENCES

3. N. Chvorinov, "Control and Solidification of Castings by Calculation," *Foundry Trade Journal*, Aug. 10, 1939, p. 95.
4. R. E. Morey, H. F. Bishop, and W. S. Pellini, "Heat Transfer Characteristics of Shell Molds," *Transactions*, AFS, Vol. 62 (1954), p. 448.
5. G. W. Form, P. J. Ahearn, and J. F. Wallace, "Mass Effect on Castings Tensile Properties," *Transactions*, AFS, Vol. 67 (1959), p. 65.
6. N. Sheptak, "Tensile Property Evaluation of Shell Mold-Cast Versus Green-Sand-Cast Magnesium Alloy Test Bars," *Transactions*, AFS, Vol. 63 (1955), p. 157.
7. B. N. Ames, "A Survey of the Shell Molding Method of Casting Production," *Transactions*, AFS, Vol. 61 (1953), p. 7.
8. R. E. Morey, H. F. Bishop, and W. S. Pellini, "Feeding Range in Shell Molds," *Transactions*, AFS, Vol. 63 (1955), p. 419.

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Casting Small Parts of

REFRACTORY METALS

A new method has been developed specifically for casting small titanium parts. It offers several advantages over processes used to produce larger castings

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● TITANIUM's high initial cost has been a deterrent to making small castings of this material for the aircraft and missile industries. Lip-pouring skull-melting furnaces, which have been used to make titanium castings, are too large to be economical and practical for castings weighing as little as ½ lb or so. This article outlines a method developed specifically for casting small titanium parts.

In production of titanium castings, the appropriate quantity of molten metal must be contained in a skull of the solid metal to prevent contamination. A suitable skull usually is provided by arc melting the charge in a water-cooled copper crucible.

The new technique dispenses with the water-cooled crucible and uses a solid block of titanium called a "casting-block." The central portion of this block is melted by a tungsten arc until the molten pool is of sufficient diameter. Then the arc conditions are adjusted to melt through the underside of the block, and the melt falls into a mold mounted directly beneath.

In these experiments, forged, commercial-purity, high carbon titanium billets 4 in. in diam were used. This diameter appears to be the minimum practical size; different thicknesses are used where varying amounts of molten metal are required. A block 1 in. thick normally produces castings of total weight of 5-6 oz and a 2-in. block produces castings of 12-15 oz.

Blocks made from compacted titanium powder cannot be used for casting operations because the furnace interior, mold, and sight glass become coated with a thick gray deposit, and poor quality castings result.

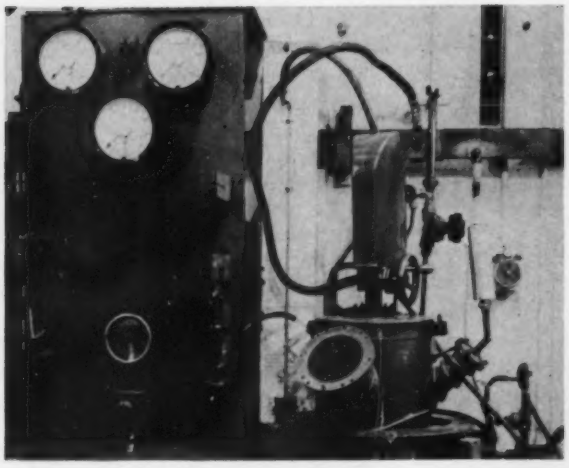
Furnace Assembly—The evaluation furnace is depicted in Fig. 1 and shown diagrammatically in Fig. 2. The design is based on that described by Geach and Summers-Smith.[1]

The negative electrode enters through the top of the shell, and its motion is controlled by a rack and pinion mechanism. The electrode tip is of thoriated tungsten ¼ in. in diam, and the electrode stem is not water cooled.

A flat copper hearth, 4 in. in diam and water cooled, constitutes the positive electrode. Argon and vacuum lines enter through the base plate, the vacuum line being connected to a two-stage rotary vacuum pump. Power is supplied by a motor generator set capable of delivering 2000 amp at 20 v. A solenoid mounted outside the shell serves to centralize and stabilize the arc.

Molds and Mold Materials—Two types of molds were used. During the early part of the investigation, when effort was concentrated on the casting technique itself, molds were machined from high-quality block graphite. The size and shape of these molds were regulated by furnace dimensions and by the amount of metal that could be cast.

Molds were restricted to 3-in. height and 3-in. diam, and mold cavities to a maximum capacity of 1 lb, including runners. Large pouring basins and ingates were utilized to catch the molten titani-



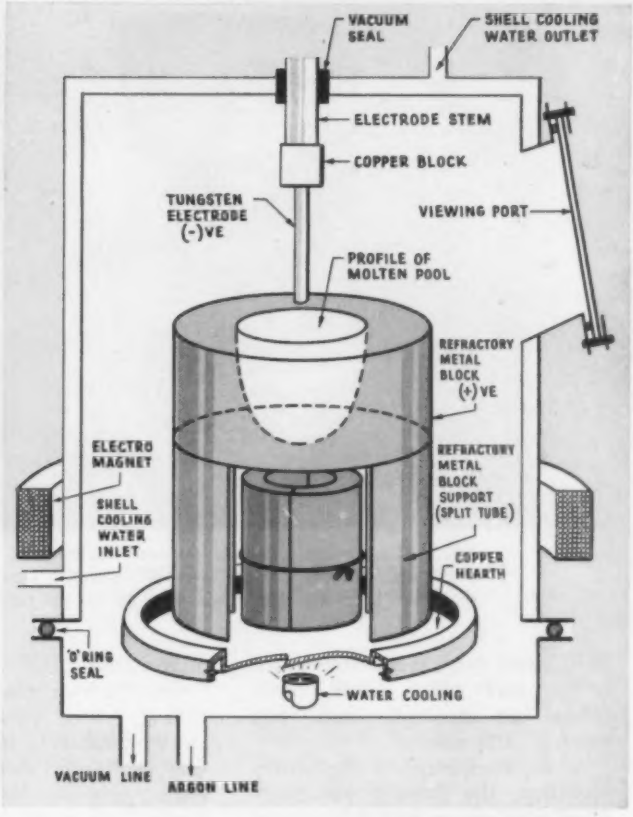


Fig. 1 (above)—Shown here is the furnace setup used to evaluate the new method for making titanium aircraft castings of ½ lb or less. Fig. 2 (right)—Diagram of the vacuum furnace identifies components

um and direct it quickly into the mold cavity before its superheat was lost. In these molds, the runner also acted as the only riser to the casting.

After machining and before use, molds and cores were baked at 800 to 850° C for 1½ hours in an argon atmosphere. This treatment removed volatile material from the graphite and, together with a leak-tight furnace, insured clean, bright castings. Molds were not preheated intentionally immediately before or during the casting operations, although some heating occurred via radiation from the casting block.

After a reliable casting procedure had been determined, it was used in an investigation to develop an expendable graphite-base mold material for titanium and other refractory metals.[2]

Casting Procedure—The mold was assembled, bound together with soft iron wire, and located in the center of the furnace hearth. Casting-block supports were placed around the mold (in these experiments, split titanium tubing was used as supports) and a block of appropriate size placed on top of the supports, concentric with the electrode and hearth as shown in Fig. 3. Then, vacuum seals were cleaned and greased, the furnace reassembled, evacuated, flushed with argon twice, and finally evacuated to a pressure of 6 cm mercury.

This pressure made it possible for melting to be carried out without the risk of glow discharge—which leads to rapid overheating of the electrode and electrode stem—and also reduced the likelihood of gas entrapment during casting.

The solenoid current and cooling water then were turned on and the open circuit voltage adjusted to 50 v. This high starting voltage reduced the possibility of the electrode's sticking into the block when the arc was struck. Melting was carried out with the solenoid current on for about 1 minute, this being sufficient time to obtain a concentric pool and a stable arc. Typical power readings were 15-20 volts and 1200 amps.

The control field then was switched off so that a deep, narrow pool was produced rather than a wide one, which can cause the outside of the block to melt and result in the loss of the molten pool over the side of the block. For a successful cast, arc length and power must be adjusted and controlled so that a deep pool with adequate superheat is formed. The pool must not be allowed to expand and reach the outside of the block, and for maximum cast weight the pool must be concentric with the block.

After melting time of 4 to 7 minutes, depending on the thickness of the block, the power was increased and the arc length decreased. After a few seconds, the bottom of the block melted through, and the molten pool passed through the resulting hole into the mold. Alternative procedures then could be followed. The power supply could be switched off immediately after the pool had dropped away so that the hole formed in the bottom of the block sealed itself. Alternatively, the power could be left on for a short time. The arc then continued to

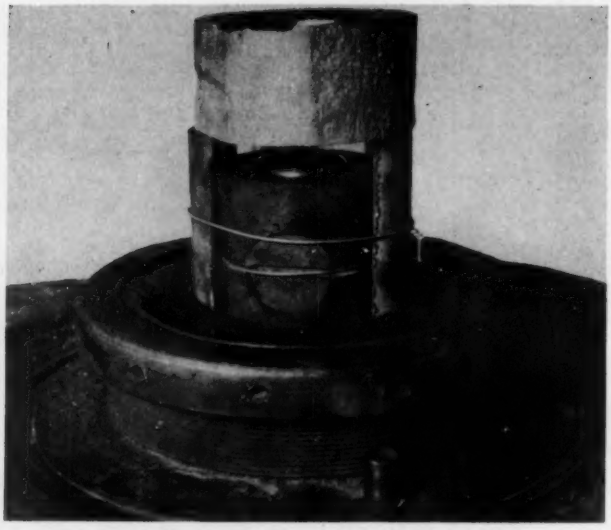


Fig. 3—Illustration shows a poured casting, still in the mold, resting on the copper hearth. Notice that the titanium block has a hole in its center

melt metal from the inside of the cavity, and this molten metal poured into the mold cavity, "hot topping" the casting.

At the completion of the casting operation, the furnace was backfilled with argon and left to cool for 15-30 minutes. Then, it was opened, the mold extracted, and the casting removed.

The casting-block was reused a number of times by filling the cavity with raw material clippings. These melted down to fill the cavity very quickly after an arc had been struck and produced a pool of the right form and dimensions for the next cast. If the block had been used for hot topping, a sheet of raw material was placed between the block and the supports to seal the orifice and prevent premature loss of the new molten pool.

Types of Castings—This method has been used successfully to produce sound titanium castings weighing 12-13 oz with risers. Tensile pieces, cast cylinders, and ⅜-in. valves have been cast with reasonably good surface quality and little contamination.

Tensile test pieces were the first shapes produced and were cast before a reliable technique had been developed. Blocks 3 in. in diam x 1 in. deep were used as raw material, and the melt often had to be discontinued because the molten pool had extended to the edge of the block and run down the side of the mold.

One or two superficially sound castings were produced in machined-graphite molds, but they had tiny contraction cavities down the center, probably because of inadequate superheat and the rapid chilling action of the graphite mold. In subsequent experiments, these defects were eliminated by the use of molds made from bonded graphite powder of lower thermal conductivity.[2] Large-scale porosity or contraction cavities did not occur in these castings or any subsequent ones.

Several cylinders were cast in a one-piece graphite mold, the weight of metal being taken as an indication of the efficiency of the casting technique used. The casting block was heated gently with a current of about 1200 amperes and 10-15 v for 3-4 minutes; then the current was increased to about 1500 amperes at 20 v for 2 minutes. Finally the arc length was shortened and the block bored through. By this procedure, a cast cylinder weighing 15½ oz was obtained. Since the casting-block initially weighed 4 lb, 24 per cent of the block was cast. This weight is considered close to the maximum possible for the existing experimental apparatus, but the yield undoubtedly could be improved by using a water-cooled electrode and a shorter electrode tip of larger diameter. The cast cylinders usually had only one small contraction cavity, which was confined to the top tenth of the casting.

To demonstrate that the method was capable of producing small useful shapes, some ⅜-in. valves were cast. No attempt was made to insure that the core profile reproduced exactly the weir of a commercially available valve. It was considered sufficient that it be approximately the correct form and size.

To cast this shape, 3-lb blocks 4 in. in diam and 1½ in. deep were found sufficient. The casting procedure was similar to that used in the production of cylinders, the time required being about 4 minutes for the casting weight of approximately 8½ oz. In all valve castings, porosity was restricted to the risers, and sound valve bodies resulted (Fig. 4). Fig. 5 shows a completed valve. Etching revealed a small, equiaxed, chill-cast grain structure, and none of the castings exhibited a deleterious columnar structure.

Other Results—Experimental observations indicate that rate of heat input is an important factor. The molten pool produced must be deep, of small diameter, and possess adequate superheat. Yet it must be retained in a block of solid titanium which is not externally cooled and is losing only heat by radiation except for a small amount by conduction through the supports. To insure good castings, the pool must be superheated to several hundred degrees above the melting point of titanium (1650° C) before the temperature of the outer part of the block is raised by conduction

TABLE I—Casting Shrinkage on Solidification

	Average Shrinkage, Inches	Specimen Size, Inches	Average Shrinkage, in./in.
Tensile pieces	0.011	⅝ (diam)	0.017-0.018
Cylinders	0.030	1½ (diam)	0.020
Valves	0.012-0.013	1 (sq)	0.013

TABLE II—Casting Contamination

	—Tungsten, %—		—Carbon, %—	
	Valve A	Valve B	Valve A	Valve B
Raw material	0.025	0.025	0.421	0.380
Cast valve	0.06	0.2	0.398	0.392
Increase in contamination	0.035	0.175	−0.02	0.01

TABLE III—Increase in Hardness on Casting

	Original Material, DPN	Valve Surface, DPN	Hardness 0.05 in. from Valve Surface, DPN	Increase in Hardness, DPN
Valve A, graphite mold	282	292	283	1-10
Valve B, baked mold	262	267	259	0-5

to the melting point. This heating can be achieved only by a high, localized rate of heat input.

The shrinkage of the titanium castings on solidification is indicated in Table I. It averages 0.017 in. per in., a figure which agrees with results of other workers.[3]

Since the castings were made in an evaluation furnace, there was little contamination by oxygen and nitrogen from the outside atmosphere. The results in Table II show that with the exception of the large pickup of tungsten in valve B (probably due to splashing of titanium on the electrode), contamination was maintained satisfactorily. These results are confirmed by the hardness values shown in Table III.

Observations—Most cast shapes produced by this technique have been sound, with shrinkage cavities confined to the topmost portions of the casting or the riser. The small contraction cavities initially observed in the tensile pieces were eliminated when bonded graphite-powder molds were used. It is possible that the remarkable soundness of the castings was caused by relatively unidirectional solidification; and it may be significant that during the casting operation the molds stood on a water-cooled hearth. When the molds were filled, solidification probably proceeded preferentially from the bottom upward so that the last part to solidify was the riser.

The process has several advantages over previous bottom-pour casting methods. A number of workers, including Beall et al[4] and Clarke,[5] have operated bottom-pour casting furnaces and report that, among other disadvantages, the inability to replace the plug which seals the casting orifice prevented quick recycling and the use of multiple molds, which are necessary for normal production practice. In addition, drips of metal, always present following a pour, solidified in the pouring spout and made it necessary to remove the skull from the crucible after each heat for trimming. The present technique overcomes this disadvantage by eliminating the plug and pouring spout.

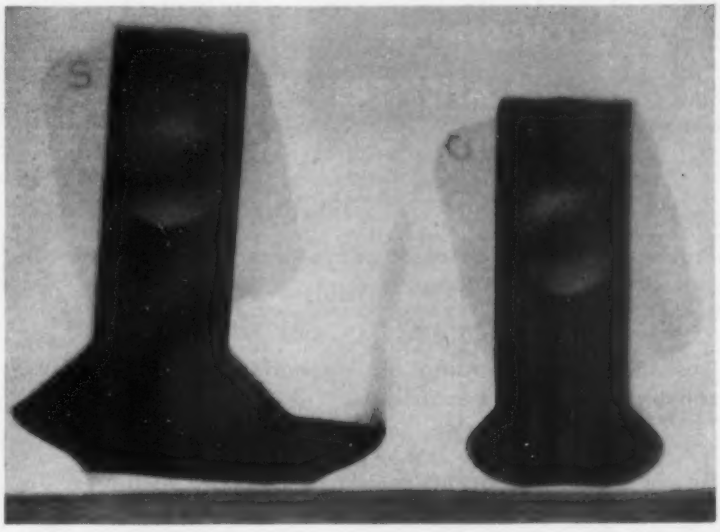
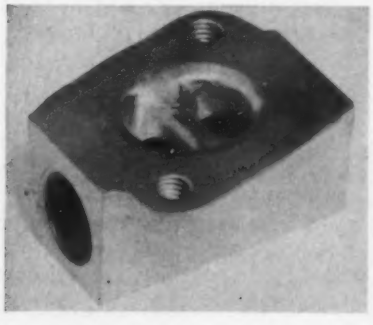


Fig. 4—This radiograph was typical; all valve castings produced were sound with all porosity confined to the risers

Fig. 5—A completed valve. As explained in the article, the castings, after etching, exhibited small, equiaxed, chill-cast grain structures



With the existing equipment, it is possible to cast 25 per cent of the charge. This percentage does not compare favorably with the 60-70 per cent possible when a plugged water-cooled crucible[4] is used, but the simplicity of the present method, which ordinarily allows immediate recycling of the casting-block, possibly outweighs the apparent advantage of high yield. Under good melting and vacuum conditions there is no reason why the casting-block should not be recycled many times before its level of contamination becomes unacceptable.

It is considered that the process could be scaled up to produce castings weighing about 5 lb. For castings of greater weight, a conventional tilting skull-furnace would be more satisfactory.

The technique also could be developed for casting production quantities of small shapes in refractory metals. For example, the furnace hearth could incorporate a turntable device, around the periphery of which would be placed a number of casting blocks. Each block could be sited over a large hole in the turntable and directly below this would be placed a mold resting on a second turntable which would rotate in conjunction with the first. After setting up, a number of casts could be made in one furnace operation, and in this way it should be possible to produce, on the average, one 8-oz casting every 10 minutes.

This technique, used in conjunction with the recently developed expendable mold material,[2] should help to reduce the cost of cast refractory metal components to a level acceptable both to the aircraft and missile industries and to other operators whose work entails the use of severely corrosive or high-temperature environments.

Acknowledgments — The author wishes to thank the directors of Imperial Chemical Industries Ltd. for permission to publish this paper and F. F. Horton and P. M. Morgan for their capable assistance in the experimental work.

REFERENCES

1. G. A. Geach and D. Summers-Smith, *Metallurgia*, 42, (250), 1950, 153.
2. A. R. C. Westwood, *Modern Castings*, 37, (3), 1960, 36.
3. P. W. Wood and R. P. Adams, *Light Metal Age*, 15, 1957, 18.
4. R. A. Beall, F. W. Wood, J. O. Borg, and H. L. Gilbert. Bureau of Mines, Dept. of Investigation 5265, August 1956, 11.
5. C. Clarke. Imperial Chemical Industries Ltd. Private communication.

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QUESTIONS and ANSWERS

- **Production of chunky castings requires the application of suitable gating principles**
- **Dust created in grinding of a beryllium-containing alloy constitutes a health hazard**
- **Heavy section of casting must receive liquid metal during solidification to avoid shrinks**
- **Grain size in Hadfield manganese steel can be controlled by following certain principles**

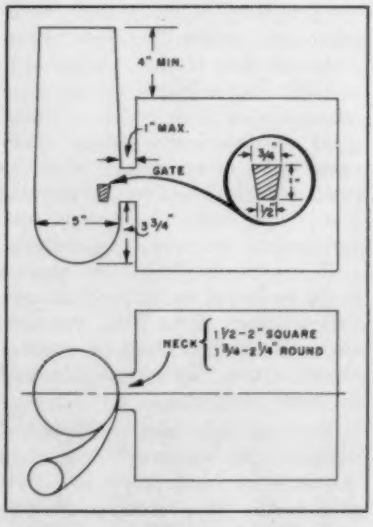
Chunky Casting Must Be Fed

We operate a small gray iron foundry and most of our production is in light castings such as stoveplate and similar work. Recently we received an order for some heavy cast iron chunks 10 in. in diam and 12 in. long which are to be used for making pistons, and must be sound throughout. We are not allowed to use any chills in the castings. Iron is melted in a cupola, and we are considering use of No. 2½ Albany sand for the molds. We will appreciate information on a facing we could use to obtain a good peel, as well as suggestions on molding, pouring, and gating.

Since your production experience is in making light-section castings, you should expect to run into many problems before you can produce successfully the heavy castings you mention. Initially we must point out that the type of iron you employ for the light-section castings will not be satisfactory for the 10-in. diam solid cylinders. It will result in castings with a coarse, open grain structure.

Although we do not know the composition of your present iron, we suspect the silicon content is considerably above 2 per cent, possibly as high as 2½ per cent. For the heavy castings the silicon level will have to be lowered appreciably, to around 1.50 per cent, and the most suitable level will have to be determined experimentally.

It appears to us that the No. 2½ Albany sand should serve since it possesses good permeability. Sand should be rammed hard to avoid swelling or enlargement of the casting. You mention use of facing, but that involves another operation and should be avoided since it adds to the cost of production. If you feel that facing is necessary, you might try a mixture of half old sand and half new sand with a 5 per cent by weight addition of seacoal. Other carbonaceous materials on the market, including carbon sand, can be used as facing, and we suggest you get in touch with your supplier for information on them.



Suggested method for gating casting

Heavy chunky castings must be fed if sound castings are expected, and we suggest that you try the gating and risering system indicated in the accompanying sketch. It follows the recommendations proposed by Winte and Barlow some years ago. The system employs a heavy riser placed as close as possible to the casting so that the connection between the two remains open until feeding is completed. The neck or connection may be round or square and within the range of dimensions indicated.

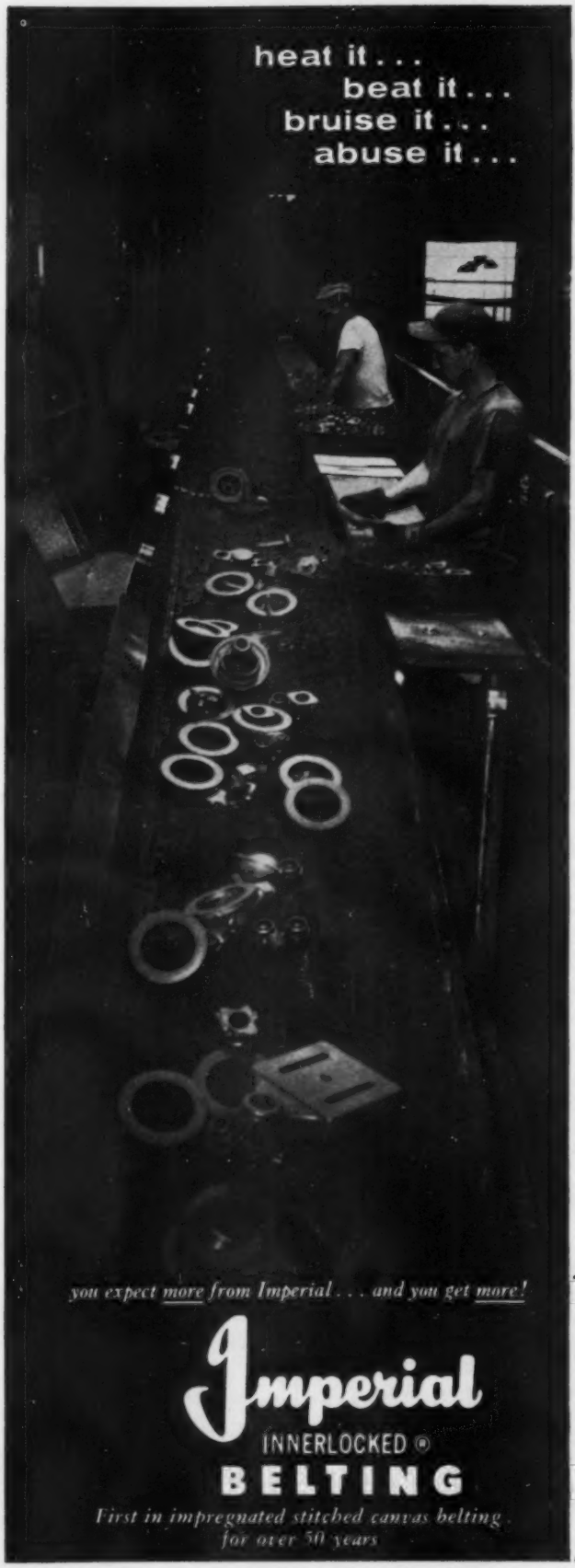
Runner from the sprue into the riser has a trapezoidal cross section and is arranged to enter at a tangent. Gate and runner are at the joint line. According to our calculations, the casting yield should be about 75 per cent.

Handling Beryllium Copper

It has come to our attention that beryllium-copper is toxic. Have you come across this point in any articles, or do you know anything about it? We are thinking about it particularly in connection with grinding a cavity in beryllium-copper. This operation, of course, involves production of dust and fine particles.

Available information indicates that low-beryllium alloys such as beryllium-copper can be handled safely except in a few cases of hypersensitive individuals or when mists, dust and fumes are involved. One or more of the latter would be present in melting and in the grinding operation you mention.

To eliminate any possibility of health hazard in connection with the grinding or other dust-creating operation, it is essential that the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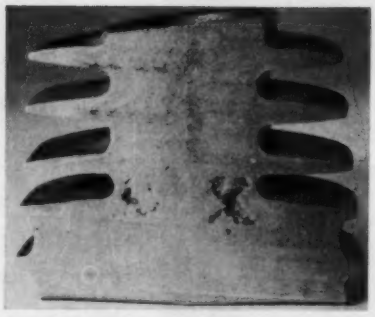
machine be equipped with a positive exhaust system. That should be attached to a suitable dust collector to prevent dispersion of the dust into the surrounding atmosphere where it might be inhaled by others in addition to the machine operator. Possibility of dermatitis can be prevented by adequate washing of the hands, arms, and other exposed parts of the body.

Defect Caused by Shrinkage

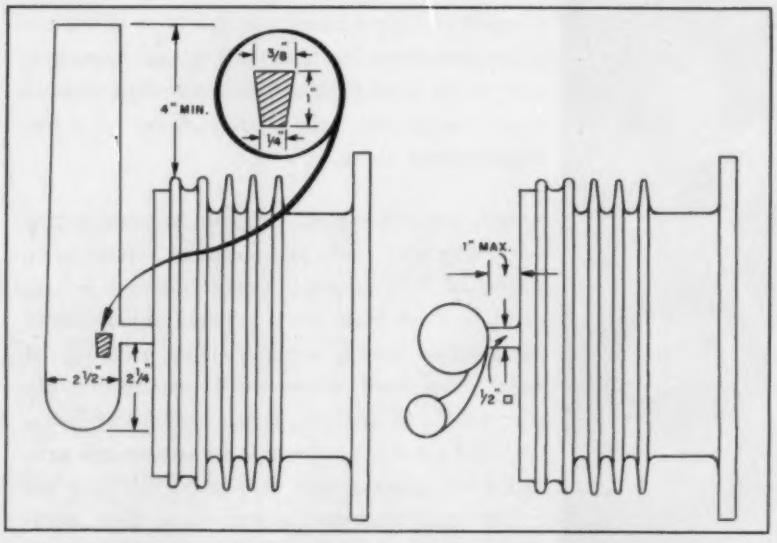
We are enclosing a drawing and photograph of a casting and are forwarding a section of it which shows internal voids. The casting is made of a high carbon equivalent iron which should not exhibit solidification shrinkage.

We gate the casting at two points near the outer edges, as indicated in the sketch, and have made a number with a riser attached at point R, but that did not help. The riser did not show any drop in metal height even when topped with exothermic compound. Therefore, we do not feel that this is a true shrinkage problem.

On the other hand, these holes seem very large to be caused by coarse graphite precipitation in the heavy section. Do you think that the condition could be caused by core gas? We have tried various means to vent the core without success.



Holes appear in the heavy section



Proposed gating employs riser close to and feeding into the heavy section

Although it is true that gray irons have a self-feeding characteristic due to formation of graphite during the eutectic reaction, which results in expansion, there are limitations to that effect. During solidification, two bands of freezing traverse the casting. The first results in development of dendrite structures and requires compensation for liquid-to-solid shrinkage. During that cycle, the iron behaves like any other metal in that if feeding is inadequate, shrinkage voids are formed in the casting.

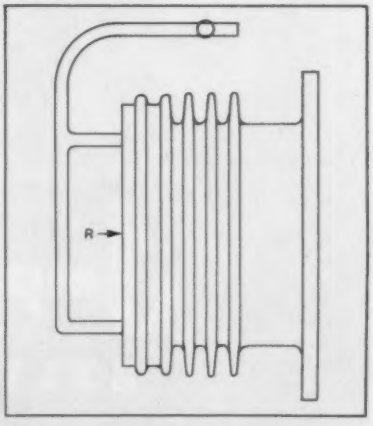
The second band involving eutectic reaction cannot proceed through the casting until movement of the dendrite band is completed because this is prerequisite to formation of liquid of eutectic composition. When the eutectic reaction band sweeps through the casting, formation of low-density graphite creates surplus liquid which is directed to any shrinkage voids formed during the movement of the first solidification band.

It is our opinion that, due to your method of gating—feeding a heavy section through a thin one—the feed is cut off before the formation of dendrite structure in the heavy section is completed. This condition results in shrinkage voids caused by volume contraction during the liquid-to-solid change. Volume of those voids is greater than can be compensated by the increase in eutectic liquid resulting from flake graphite formation.

As to the apparent failure of the riser at the center portion of the casting, unless the temperature of the iron in the riser is sufficiently high to maintain it in a highly liquid state until the casting freezes, it will not function properly. We would expect the iron in the riser to be relatively low in temperature due to cooling effects in flowing from the gate locations.

Although exothermic compounds do aid in keeping risers fluid, the time of application is important. If applied too early, the metal in the riser does not remain liquid sufficiently long to provide feeding at the required time. If applied too late, portions of the riser may have solidified to the point that they cannot be liquefied. Undoubtedly if an exothermic riser sleeve of suitable wall thickness had been used, the riser would have functioned.

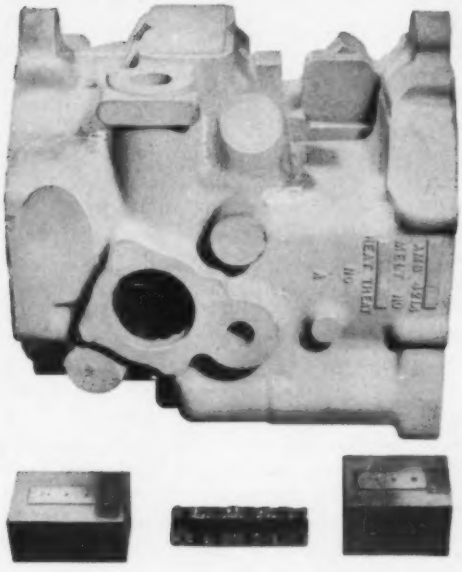
We believe that the shrinkage areas in your casting can be eliminated by use of a suitable gating system, and suggest you try that shown in the accompanying sketch. As indicated, the casting is gated into the heavy portion through a riser placed close to it to insure that the connecting neck remains open.



Present method of gating casting

ITS JOB:

Watching the diet of hungry jets



Casting for jet engine fuel control valve made by Bendix Products Division, South Bend, Indiana.

Radiograph of casting showing soundness and condition of internal passages.

A maze of passages and channels, this intricate casting becomes a jet fuel control valve. Bendix checks the soundness of the body and clearness of the passages with Kodak Industrial X-ray Film.

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Can you supply any information on a difficulty we are having in obtaining fine grain structure in our high manganese (13 Mn, 1.2 C, 0.40 Si) steel castings poured on the side floor. Castings range in weight from 5 to 250 lb. Steel is poured at 2650 to 2800° F from 1000-lb monorail ladles filled from a 12,000-lb ladle. Is the trouble caused by high pouring temperature or other factors?

Manganese steel reacts to the effects of temperature and cooling rate, the same as other steels. That is, high temperatures and slow cooling rates cause large grain size. Those point the way to grain size control, but execution is another matter. The pouring temperature range you mention is that usually suggested, but there are indications that the maximum of 2800° F should not be exceeded since a coarse crystalline structure which cannot be reduced by succeeding heat treatment, may result.

It hardly seems necessary to point out that the high side of the range should be used for the thin-section castings, decreasing the temperature as the section size increases. In that connection, Cousans and Meredith some years ago stated that high manganese steel at a temperature of 2700° F is very fluid. Also Gardom pointed out that track links or shoes poured at temperatures in excess of 2730° resulted in production of long columnar crystals in the castings. Again, it is obvious that cooling rate may be accelerated by application of chills, but often that step leads to other complications.

Another possibility in grain size control exists in the heat treatment and quenching operations, which are essential in production of manganese steels. In heat treatment, the temperature must be sufficiently high and the time at temperature long enough to insure complete austenitization. Temperature range is given as 1830 to 1940° F, depending upon composition—particularly carbon content—and generally the temperature used is on the high side of the range.

Avery states, however, that above 1850° F equilibrium is established in 20 to 30 minutes, but a time lag to insure that all sections of the casting are at temperature is required. Use of higher temperatures provides insurance that complete austenitization will occur, and at a more rapid rate. After the castings have been exposed to the austenitizing treatment for the proper period of time, they must be quenched without any delay in highly agitated water.

One additional means of controlling grain size in this type of steel is described in U. S. Patent No. 1,975,746 granted to the late John Howe Hall in 1934. The castings are heated at 750 to 1110° F for 12 to 96 hours to transform the as-cast structure into martensite, sorbite, pearlite, etc., and they are cooled slowly. Then the castings are reheated to 1940° F and quenched in water. It seems, however, that the long cycle involved in that procedure hardly would be economical except in special cases.

Plaster Molding Suggested

Could you send us any additional information on casting of bells, which was mentioned in *Gates and Risers for Castings* by Pat Dwyer? Are there any other books or articles dealing particularly with casting of bells for tune playing, especially small hand bells?

So far as we know, there are no books describing the procedures of bell making. From time to time, articles have appeared in the literature, but they relate primarily to relatively large bells which are "swept up" in loam, a type of sand high in clay and quite moist, by use of formed templates called sweeps or strickles. After the molds have been formed, they are dried by baking.

Small bells such as you contemplate making would be made on a commercial basis in green sand—that is, moist molding sand. The sand preferably should be of a fine grain to provide a smooth surface, but not too fine since the low permeability might result in surface blows.

Assuming that you expect to make these bells only on a small scale, it is suggested that you try the plaster molding process. In this method a type of plaster of paris or gypsum called "casting plaster" is employed as the molding medium. It is mixed with water to form a slurry which is poured around the bell pattern to form the outside or cope mold, and as will be explained later, into the interior to form the drag mold.

After a short period of time the plaster "air sets" or hardens and is removed from the pattern. The two half-molds are dried thoroughly in an oven. Time required depends on mold thickness and temperature. At a temperature of 500° F, the time required will be 12 to 14 hours.

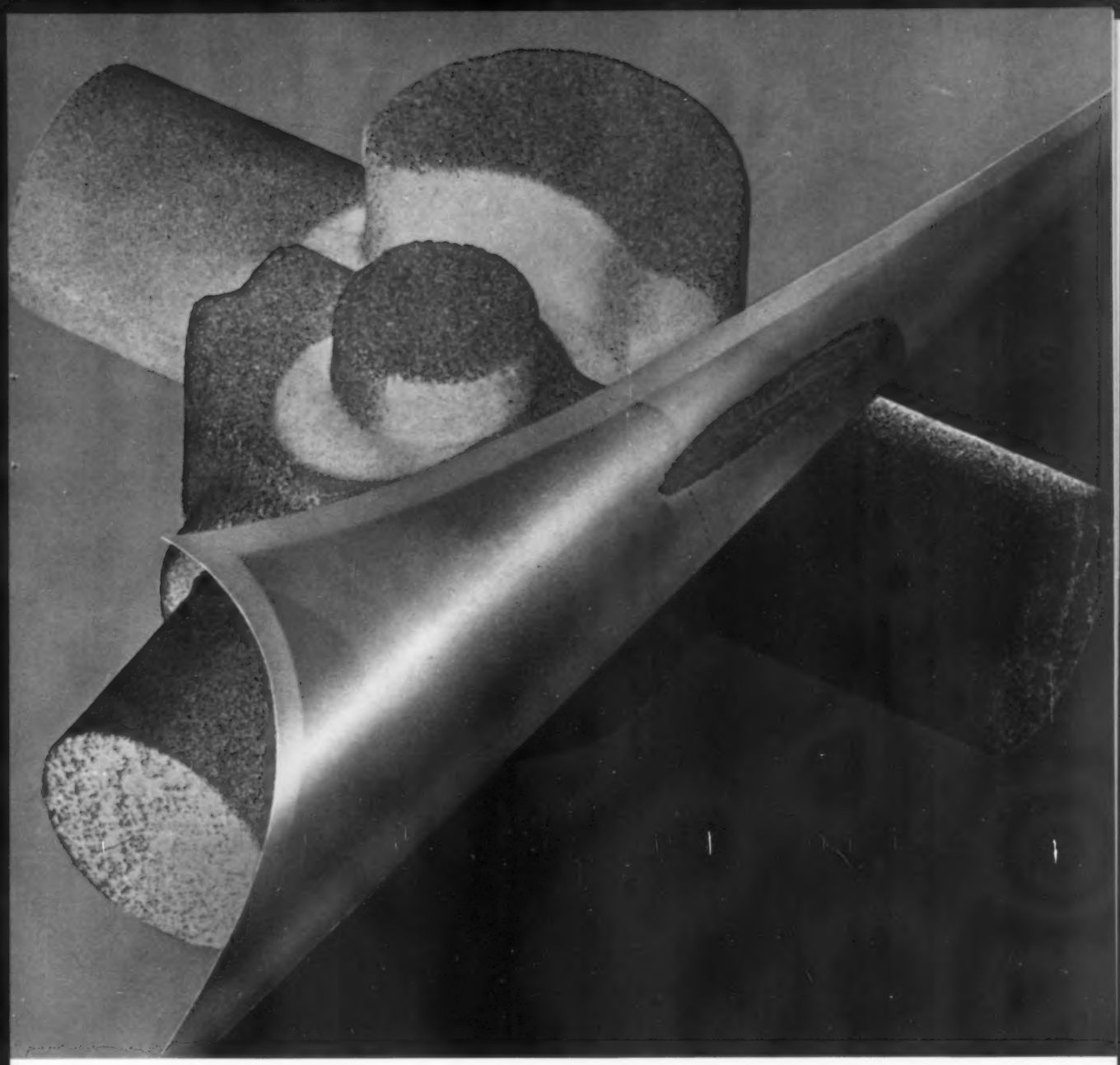
While still warm, preferably around 220° F to prevent pickup of moisture, the molds are assembled, clamped together, and filled with molten metal.

For a pattern, one of your present bells can be used. It will have to be coated inside and out with a parting or release agent such as a thin coat of light mineral oil, a mixture of 1 part petrolatum and 2 parts kerosine, or ½ lb stearic acid dissolved in 1 pint kerosine. Place the bell on a flat board, opening down, and enclose it with an oiled flask comprised of two L-shaped sections clamped together. Height should be 2 or 3 in. above the top of the bell.

Plaster is poured slowly into the flask, and after it has set, the assembly is rolled over so that the opening of the bell is up. The board is removed, the plaster face coated with parting agent, and a flask of the same type, except only a couple of inches deep, set on the plaster mold. This flask is invested with plaster which will flow into and fill the interior of the bell. After the plaster has set, this mold forming the drag half is removed from the assembly. Then the bell is removed from the other half-mold. This mold is rolled over, and a cup or funnel-shaped gate or opening is cut in the center from the top to the cavity. That operation can be performed easily since the mold still is moist and relatively soft. The flasks then are removed, and the molds placed in the oven to dry.

Alloy composition for bells varies to a considerable extent, but it is reported that the most suitable is in the range 78 to 80 per cent Cu, and 22 to 20 per cent Sn—preferably 78 per cent Cu, and 22 per cent Sn.

Circle 581, Page 39→



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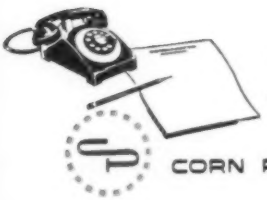

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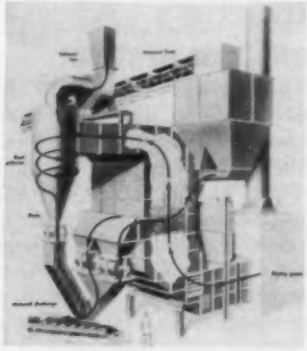
Mobile Ferroscope is rated at 3000 amp and can be used to find surface and subsurface defects such as thermal cracks, hot tears, and shrinkage in castings. The unit operates on ac or half-wave dc and is effective in inspecting parts too large for stationary wet horizontal units. It measures 23 x 37 x 37½

in. and weighs 600 lb. Solid rubber casters are fitted so that the unit can be moved easily in the plant.—**Picker X-Ray Corp.**, White Plains, N. Y.

For More Details Circle No. 451—Page 39

SAND DRYING UNIT

Drying unit is designed to dry sand and can be modified to cool sand also. The illustration shows a typical arrangement. Material is



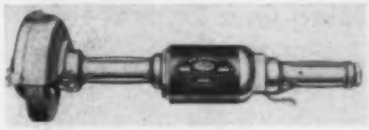
fed into the dryer, where hot gases from the furnace are pulled up by suction of the exhaust fan through the constriction plate and through the bed of material. A mild turbulence in the material surrounds each particle with hot gases and dries the material quickly.

The fluidized material flows like water through a discharge chute into a motorized air lock and is discharged. Fines are collected in the dust collector and recombined with the heavier material delivered by the dryer. The entire operation is continuous and automatic.—**Link-Belt Co.**, Dept. PR, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 452—Page 39

HORIZONTAL AIR GRINDERS

Two air grinders basically are horizontal grinders, but can be used for wire brushing and buffing with a longer spindle. Model 541 operates at 4250 rpm with an 8-in. grinding wheel and at 6000 rpm with a 6-in. wheel. Model 517 is



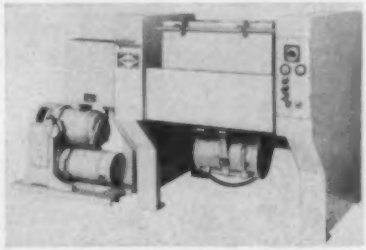
available with speeds of 4500 and 6000 rpm with a 6-in. wheel and 9000 rpm with a 4-in. wheel.

Features include a lever momentary throttle; a throttle safety lock for changing wheels; lightweight magnesium housing; full flow throttle with stainless steel ball valve and replaceable, oil-resistant rubber valve seat; screen for inlet air which is removable without unthreading; floating rotor construction with iron end plates; double row ball bearing with labyrinth seal; four precision ball bearings; shock absorber between spindle and rotor; steel case; and comfortable hand hold.—**Albertson & Co.**, Sioux City, Iowa.

For More Details Circle No. 453—Page 39

VIBRATORY METAL FINISHER

Line of vibratory finishing machines has been introduced in sizes from 1/10 to 20-cu-ft capacities to clean, descale, deburr, radius, finish, burnish, color, and abrade castings. All units feature full radius rollover tub design for most effective contact area, compact cutback housing, 180-degree tilt for easy unloading, lower over-all height for loading and unloading convenience, and controlled orbital flow pattern with synchronous vibration to pro-

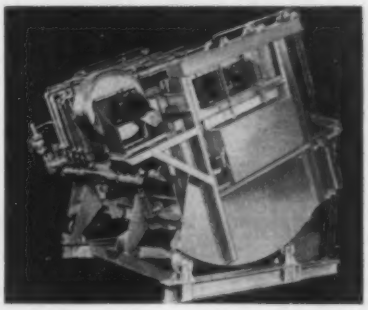


vide improved finishing at greatest speed. No special flooring is required for installation, yet all machines operate quietly when mounted directly to the plant floor.—**Abrado Finish Corp.**, 1750 Elizabeth Ave. N.W., Grand Rapids, Mich.

For More Details Circle No. 454—Page 39

MELTING FURNACE

Model RTPW radiant melting furnace is designed to melt aluminum or magnesium with highest possible purity, low porosity, and



less than 1 per cent metal loss. A preheating hearth is provided, with automatic, dual-stroke ingot loader, to minimize oxide inclusions, hydrogen absorption, and bath temperature variation. Radiant panel

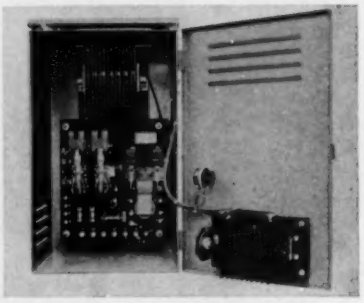
firing provides uniform heat distribution without flame impingement. Fuel consumption is approximately 1000 Btu per pound. Runners, gates, and biscuits are melted in a remelt well separated from the main bath by a dividing wall to allow only subsurface metal flow.

The hydraulic tilting mechanism is controlled for even metal flow, and either cradle or nose tilt motion can be provided. The spout releases only clean metal from below the bath surface and permits complete emptying with 20-degree tilting. Melting capacities up to 2000 lb per hr are available.—**J. A. Kozma Co.**, 2471 Wyoming, Dearborn, Mich.

For More Details Circle No. 455—Page 39

LIFTING MAGNET CONTROLLER

Lifting magnet controller is an automatic discharge type which provides clean release of complete load, release of partial load, and dribbling. The controller is assembled inside a NEMA type 1 enclosure for wall mounting and is designed for use with all types and makes



of lifting magnets. It can be operated by a small notched position master switch or a contact-type pushbutton station.—**Euclid Electric & Mfg. Co.**, Madison, Ohio.

For More Details Circle No. 456—Page 39

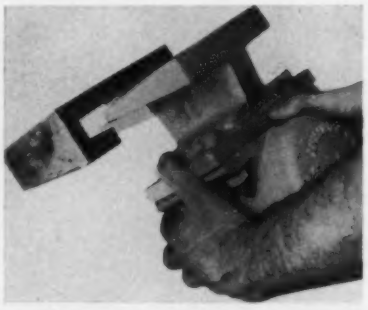
CEREAL CORE BINDER

Unicore cereal core binder has high density which is claimed to permit up to 20 per cent reduction in amount used in core mixes while providing physical properties equal to or better than otherwise obtainable, resulting in lower cereal costs. Any density within a range of 425 to 600 grams per dry quart can be specified by the customer. According to tests and actual use, the binder has good ratings in gas evolution, flowability, time needed for manual touchup, toughness, workability, etc., as well as unusually high overhang properties.—**General Foods Corn Mill**, Kankakee, Ill.

For More Details Circle No. 457—Page 39

ELECTRIC VIBRATOR

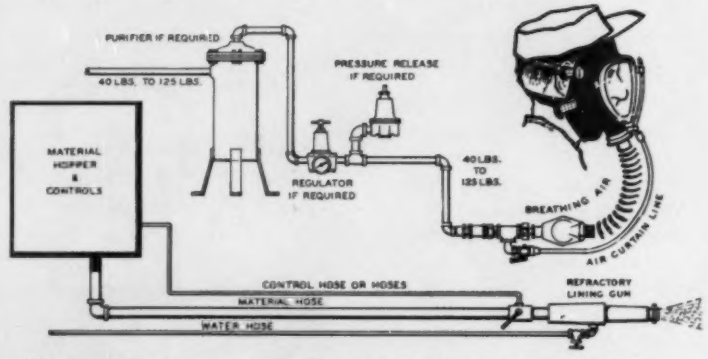
Portable, light duty electric vibrator, Model RC-5 LSRR is designed to move materials from bins, hoppers, and trucks. It attaches with a cast iron wedge and bracket to permit dismounting. The unit weighs 40 lb and can deliver up to 275 lb impact at 3600 vibrations per min-



ute. The bracket is 4⅝ in. high by 7½ in. wide, weighs 15 lb, and is to be welded to the bin, hopper, or truck. The vibrator is 7½ in. long and, together with the wedge, extends 10 in. from the structure when mounted. A 9-ft lead of heavy duty cable with a watertight disconnect plug is furnished with each vibrator. It is available for operation on 60-cycle, single or three-phase current at 110, 220, 440, or 550 volts.—**Cleveland Vibrator Co.**, 2828 Clinton Ave., Cleveland 13, Ohio.

For More Details Circle No. 458—Page 39

Mask Provides Air to Lining Gun Operator



Mask for operators of cupola lining placement guns provides unobstructed vision and clean air to breathe. A curtain of flowing air in front of the mask's lenses keeps them clear of all but the largest gobs of lining material, and air for breathing is supplied to the interior of the mask from the same source that serves the placement gun. A ⅜-in. hose runs along with the material and water lines so that a regulator and air purifier may be placed in the breathing air line if necessary.

Operating pressure usually is between 60 to 100 psi and the volume needed to maintain the air curtain and supply the operator is 10 to 15 cfm. The operator usually keeps the air curtain full on but regulates the breathing air to suit his needs.—**Acme Protection Equipment Co.**, 1201 Kalamazoo St., South Haven, Mich.

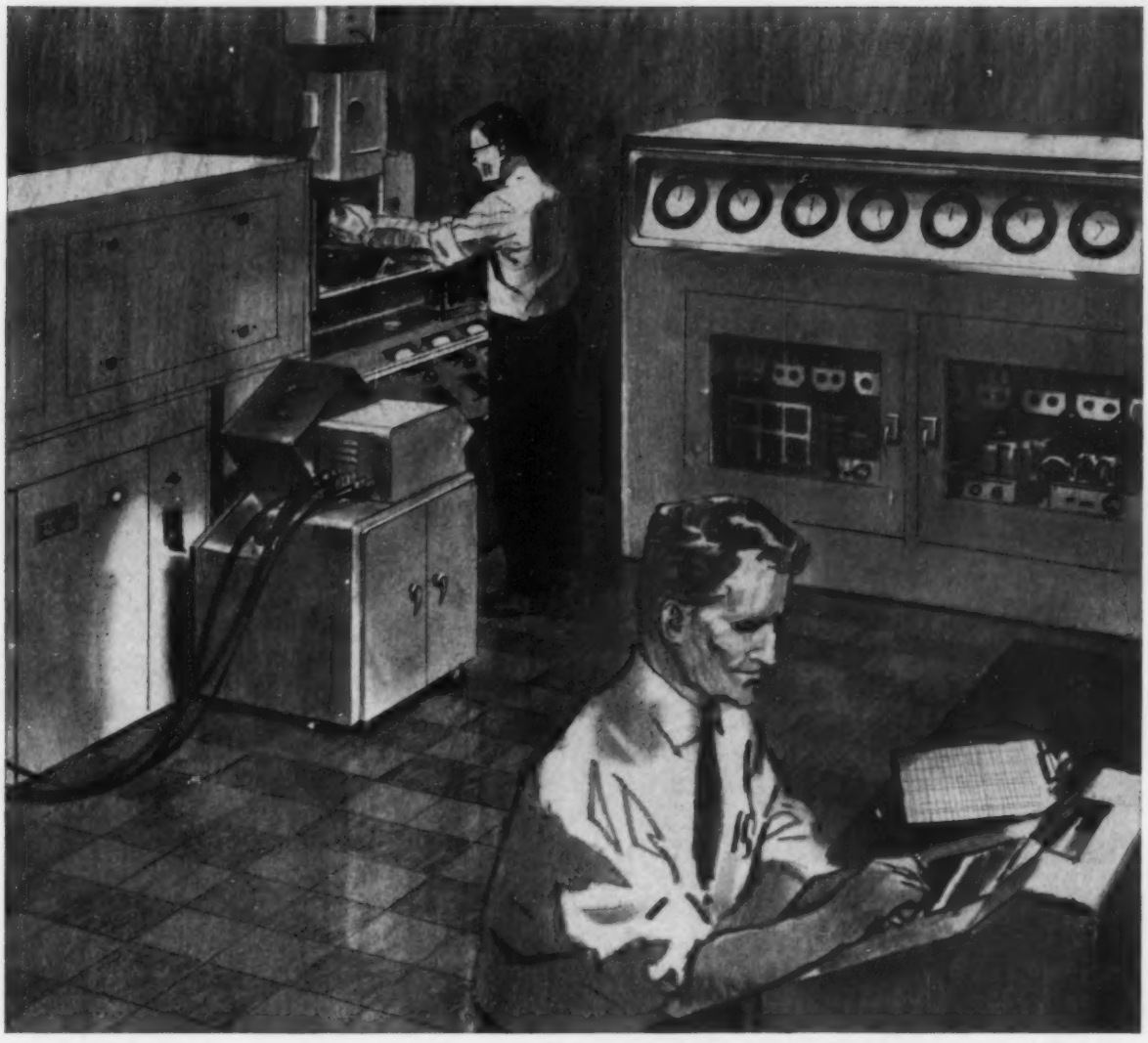
For More Details Circle No. 485—Page 39

PHENOLIC SAND BINDER

Phenolic resin BRP-8875 is a finely powdered, thermosetting sand binder to be used for production of cold-coated sands for both dumpbox and blowing operations. Cold coating is accomplished by the powder-alcohol process. The resin gives a free-flowing, nonblocking, coated sand that has good storage properties. Shell molds and cores are said to release easily from patterns, are dimensionally stable, and produce castings with good surface smoothness.

Using 2.8 per cent of the binder on Wedron sand (AFS No. 80), hot

Birth of a Gray Iron Casting—No. 5



QUALITY CONTROL . . .
NEVILLE PIG IRON AND FOUNDRY COKE

Quality controls exercised in the selection of ores and coals and carried into every step of production are the main reasons why Neville Pig Iron and Neville Foundry Coke have earned the highest reputation in the foundry industry.

Just recently a Research-Direct Reader Spectrograph was placed into operation. This instrument provides both production and quality control over the constituent elements in raw materials, assuring maximum quality in all grades of Neville Pig Iron.

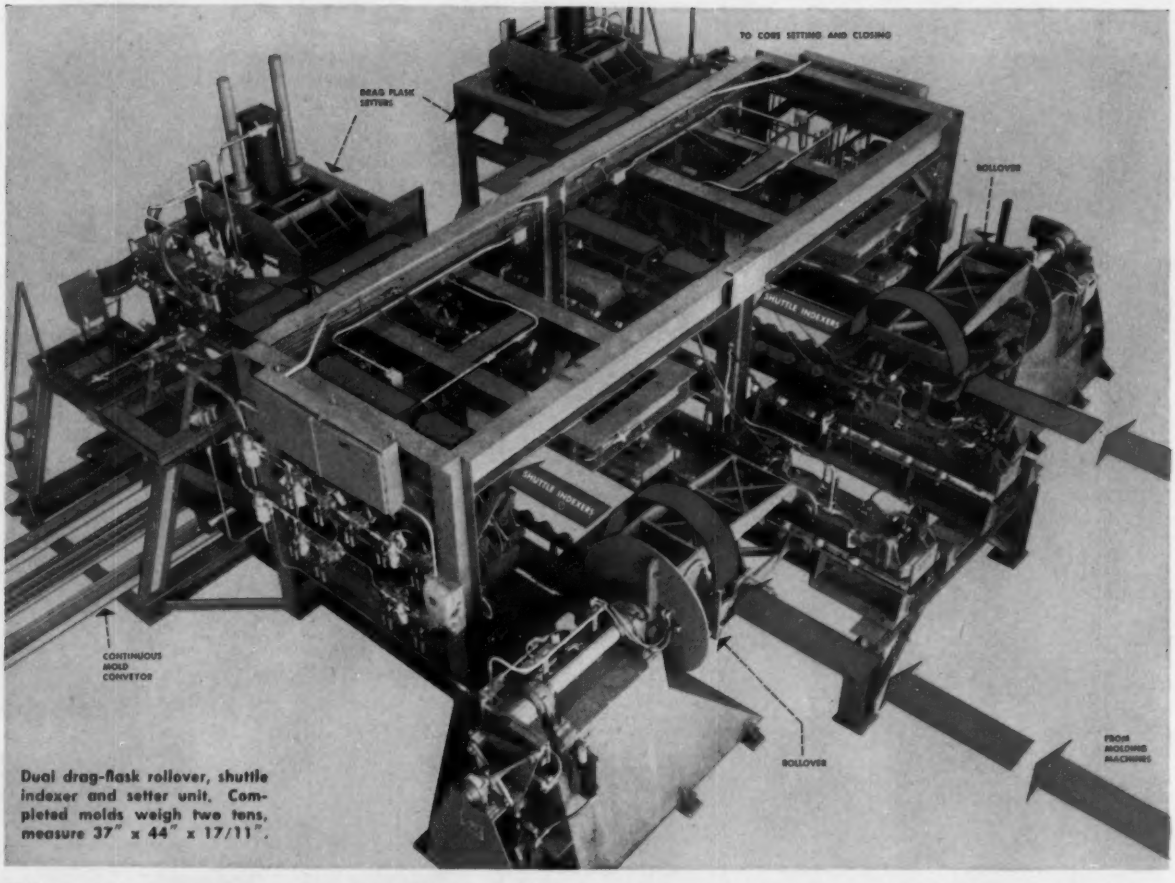
In like manner, every carload of Neville Foundry Coke has been sampled and tested in our modern laboratories during production and prior to shipment. With this procedure Pittsburgh maintains the high standards of physical properties and chemical analysis so essential in the production of quality by-product foundry coke.

Select ores and coals, experience and competence, are the vital ingredients of Neville Foundry Coke and Neville Pig Iron . . . raw materials that aid the foundry in the production of superior gray iron castings.

COKE & IRON DIVISION
PITTSBURGH
COKE & CHEMICAL CO.
GRANT BUILDING PITTSBURGH 19, PA.

Neville Pig Iron and Neville Coke for the Foundry Trade

For More Information Circle 583, Page 39



Dual drag-flask rollover, shuttle indexer and setter unit. Completed molds weigh two tons, measure 37" x 44" x 17/11".

Planet system automatically strips and closes 250 one-ton flasks on continuous mold conveyor

To design a system that will strip and close flasks automatically on a continuously moving conveyor has always been a perplexing problem. But Planet Corporation solved this problem for one of the automotive industry's largest foundries . . . and at the same time provided the key to increase productivity approximately 400%. In addition, this unusual system provides maximum casting flexibility and operational reliability.

Flask Handling System Operation . . .

Following molding, the drag flasks are fed into the dual drag-flask rollover, shuttle indexer and setter unit (see diagram). The flasks are rolled over 180°, then indexed to the unique in-flight setters which accurately positions them on the continuously moving car-top mold conveyor. From this point, they are moved through core setting to the dual cope-flask-closing unit. The cope-flask subsystem, from molding to closing, is similar to the drag-flask unit except rollovers are not required.

After pouring and cooling, the cope-flask-stripper unit lifts the cope flask off the drag. The drag flask continues on the mold conveyor to the drag "pick-off", or lifting, device. On their removal from the conveyor, the flasks are recirculated through the system. Both removal operations are performed while the mold conveyor moves as a constant speed.

This integrated materials handling system *increased productivity approximately 400% and resulted in substantial cost savings.*

Production Flexibility . . .

With this flask handling system, it is possible to produce either six-or four-cylinder blocks or both simultaneously. This feature provides this large automotive foundry with maximum casting flexibility . . . a maximum capacity of 500 blocks an hour.

Built-in Reliability . . .

Flasks handled by this system are controlled electrically and are locked at each position. They are parted or joined by lifting or lowering movements to eliminate damage to parting surfaces. The control system, which required more than 10 miles of wire and 600 relays, includes a feedback feature which allows pinpoint maintenance.

For additional operational reliability, this system was shop wired and piped, and shop tested.

An Example of Planet Versatility . . .

This is one example of Planet Versatility . . . Planet Corporation's ability to engineer, fabricate and install custom equipment that solve materials handling problems. Planet Versatility means you'll benefit from our diversified experience gained through service to leading corporations. It has paid them to plan with Planet . . . it will pay you, too! Write or call for complete information.

Sales Offices in Principal Cities in the United States and Mexico

PLANET CORPORATION
1818 SUNSET AVENUE
LANSING, MICHIGAN

- Engineered Handling Equipment
- Automation Equipment
- Mill & Foundry Equipment

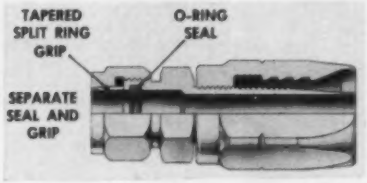
14

tensile strengths of 560 psi have been achieved in 135 seconds at 450° F. Cold tensile strengths of 630 psi have been obtained with the same sand cured two minutes at 500° F.—**Union Carbide Plastics Co.**, division of Union Carbide Corp., 270 Park Ave., New York 17, N. Y.

For More Details Circle No. 459—Page 39

TUBE END HOSE FITTING

Tube end hose fitting permits joining of tube directly to one end of a hose assembly without the use of an adapter. The tube end



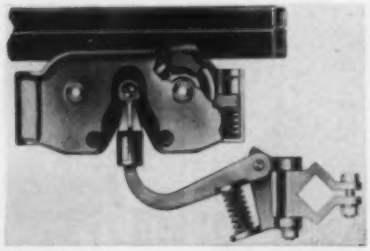
incorporates an O-ring seal fitting with separate grip and seal which eliminate the need for a female swivel or any threading, flaring, or soldering of tubes or pipes. The tube need not be cut straight or to exact length. The fitting gives the tube added support and is not affected by vibration. Since there is no damage to the tube or fitting in installation, they can be reused or reassembled as often as desired.

These fittings are available for either double wire braid hose (as illustrated) or single wire braid hose and in hose sizes from 3/16 to 1½ in. ID with tube OD sizes from ¼ to 1½ in.—**Lenz Co.**, 3301 Klepinger Rd., Dayton 1, Ohio.

For More Details Circle No. 460—Page 39

CONDUCTORS AND COLLECTORS

Enclosed electrical conductors and current collectors, as illustrated, are

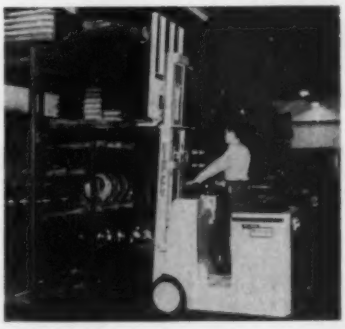


for use on cranes and monorail systems. Useful life of these current collectors is said to have been increased substantially over that obtained by prior methods. Increased safety; reduced rolling friction; smoother, more positive guiding through switches and interlocks; and longer life result from their construction. It features a guiding trolley equipped with large-diameter, deeply grooved ball-bearing guide wheels of nonconducting material and a pair of independently sprung bronze shoes for current pickup.—**Consolidated Crane Inc.**, P. O. Box 3093, Terminal Annex, Los Angeles 54, Calif.

For More Details Circle No. 461—Page 39

STANDUP FORK TRUCKS

Series JC is a line of standup, center control electric fork trucks. Capacities are 2000, 2500, and 3000 lb at 24-in. load center. All three models feature a choice of standard or full-free-lift mast, two separate braking systems and controlled castor wide tread steering axle. Removal of a single cover plate ex-



poses drive and pump motors, hydraulic pump, travel and hoist contactors, valves, switches, and hydraulic connections for quick inspection or servicing.—**Mercury Mfg. Co.**, subsidiary of Pettibone Mulliken Corp., 4700 W. Division St., Chicago 51, Ill.

For More Details Circle No. 462—Page 39

PORTABLE POTENTIOMETER

Portable potentiometer measures temperatures; checks thermocouple-actuated indicators, controllers, or recorders; and checks other potentiometers. Included as standard equipment are nine interchangeable, direct-reading scales for use with any type of thermocouple. Each scale has a length of over 4 ft, and the unit's guaranteed accuracy is 1/6th of 1 per cent. Mounted in a plastic case with simulated walnut grain, the instrument measures 12¼ x 9 x 8½ in. and weighs 12 lb.—**Technique Associates**, 1413 Cornell, Indianapolis 2, Ind.

For More Details Circle No. 463—Page 39

MAGNETIC PARTICLE POWDERS

New materials called concentrates are for the wet method of visible and fluorescent magnetic particle testing to locate invisible cracks in ferrous material and parts. All are in powder forms. Compared to the company's previous materials, they are claimed to incorporate superior features such as easier mixing, handling, and storage; a measurable increase in fluorescent brilliance from

70 to 600 per cent (see illustration); closely controlled particle size range; less foaming; and more corrosion protection. Four of the materials are for the visible red or black Magnaflux method and four are for the more sensitive fluorescent Magnaglo method. Certain concentrates are formulated for oil suspensions and others are for water. Each has different characteristics related to particle size, magnetic properties, color contrast, and concentrations.—**Magnaflux Corp.**, a subsidiary of General Mills, 7300 W. Lawrence Ave., Chicago 31, Ill.

For More Details Circle No. 464—Page 39

PNEUMATIC GRINDERS

Portable pneumatic vertical grinders are lightweight with a low profile and can be used for grinding, sanding, and wire brushing. Series 907 grinders are available in a

choice of speeds from 3100 to 9000 rpm and Series 908 from 3100 to 6000 rpm. Each series is available in straight or lever throttle models

Fine FANNER CHAPLETS

a size and type for every requirement

MOTOR CHAPLETS

the best chaplets for castings up to 1" thickness

STEM SIZE	HEIGHT	SIZE OF HEADS ROUND OR SQUARE
12 Ga. and smaller	⅛" — 1"	⅛" to 1 ½"
1/8" to 10 Ga.	⅛" — 1"	⅛" to 1 ½"
3/16"	⅛" — 1"	½" to 1 ½"
1/4"	⅛" — 1"	⅝" to 1 ½"

Available with perforated heads, tilted heads, one head or two heads curved, and over 1" high at extra charge. No extra charge for stem grooving, hot tinning or copper coating.

SOLID BUTTONHEAD OR BOILER CHAPLETS

for solid support and perfect fusion

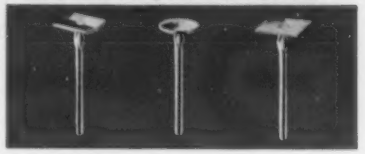
Heads: One Solid Round and One Fitted Round or Square Plate

STEM SIZE	STEM LENGTH	SIZE OF HEAD — ROUND OR SQUARE
1/4" — .250"	3/8" — 1"	½" to 1"
3/16" — .192"	3/8" — 1"	½" to 1"
1/8" — .135"	1/4" — 1"	½" to 1"

Available with perforated heads, tilted heads, one or two heads curved, and over 1" high at extra charge. No extra charge for stem grooving, hot tinning or copper coating.

WROUGHT IRON FITTED SINGLE HEAD CHAPLET

with form fitting heads and Superstems



RADIATOR CHAPLETS

the finest chaplet for light core work

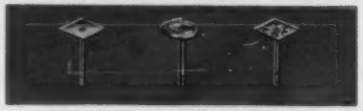
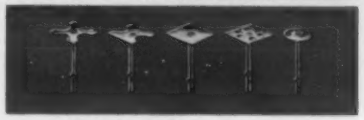


PLATE HEAD — STRAIGHT STEM

STEM SIZE	STEM LENGTH	SIZE OF HEAD
15 - 16 Ga.	1" and under	⅝" to 1 ½"
13 - 14 Ga.	1" and under	⅝" to 1 ½"
11 - 12 Ga.	1" and under	⅝" to 1 ½"
10 Ga.	1" and under	⅝" to 1 ½"
6 - 8 - 9 Ga.	1" and under	⅝" to 1 ½"

WIRE COIL — STRAIGHT STEM

WIRE GAUGE	STEM LENGTH
15 - 16 Ga.	1" and under
13 - 14 Ga.	1" and under
12 Ga.	1" and under
8 - 9 - 10 Ga.	1" and under



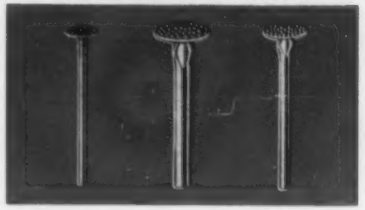
SHOULDER RADIATOR CHAPLETS

STEM SIZE	STEM LENGTH	SIZE OF HEAD (SQUARE)
13 - 16 Ga.	1" and under	½" to ¾"
13 - 16 Ga.	1 ⅛"	½" to ¾"
13 - 16 Ga.	1 ½"	½" to ¾"
13 - 16 Ga.	1 ⅝"	½" to ¾"
13 - 16 Ga.	2"	½" to ¾"
13 - 16 Ga.	2 ½"	½" to ¾"

Available in 6, 8, 10, 11, 12 gauge stem at extra charge. Perforated heads and copper coating at extra charge. Standard with tin coating.

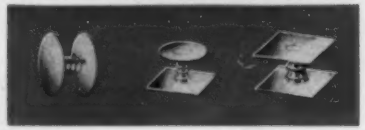
WROUGHT IRON FORGED SINGLE HEAD CHAPLET

with non-skid heads and Superstems



SMALL DOUBLE HEAD CHAPLETS

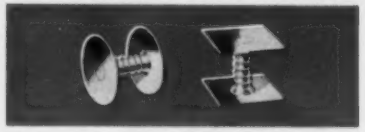
Riveted or Welded Plates — Round or Square



STEM SIZE	STEM LENGTH	SIZE OF HEAD ROUND OR SQUARE
3/16"	1" and under	18 Ga. ½" to 1 ½"
3/16"	1 ⅛" - 1 ½"	18 Ga. ½" to 1 ½"
3/16"	1 ⅝" - 2"	18 Ga. ½" to 1 ½"
3/16"	2 ⅛" - 2 ½"	18 Ga. ½" to 1 ½"
3/16"	2 ⅝" - 3"	18 Ga. ½" to 1 ½"
1/4"	1" and under	16 - 18 Ga. ⅝" to 1"
1/4"	1 ⅛" - 1 ½"	16 - 18 Ga. ⅝" to 1"
1/4"	1 ⅝" - 2"	16 - 18 Ga. ⅝" to 1"
1/4"	2 ⅛" - 2 ½"	16 - 18 Ga. ⅝" to 1"
1/4"	2 ⅝" - 3"	16 - 18 Ga. ⅝" to 1"

Available in Groovestem or Superstem at no extra cost. Hot tinned or copper coated at no extra cost.

MEDIUM DOUBLE HEAD CHAPLETS



STEM SIZE	STEM LENGTH	SIZE OF HEAD ROUND OR SQUARE
3/8"	1" and under	16 Ga. 1" to 2"
3/8"	1 ⅛" - 1 ½"	16 Ga. 1" to 2"
3/8"	1 ⅝" - 2"	16 Ga. 1" to 2"
3/8"	2 ⅛" - 2 ½"	16 Ga. 1" to 2"
3/8"	2 ⅝" - 3"	16 Ga. 1" to 2"
3/8"	3 ⅛" - 3 ½"	16 Ga. 1" to 2"
3/8"	3 ⅝" - 4"	16 Ga. 1" to 2"
1/2"	1" and under	14 Ga. 1 ½" to 2 ½"
1/2"	1 ⅛" - 1 ½"	14 Ga. 1 ½" to 2 ½"
1/2"	1 ⅝" - 2"	14 Ga. 1 ½" to 2 ½"
1/2"	2 ⅛" - 2 ½"	14 Ga. 1 ½" to 2 ½"
1/2"	2 ⅝" - 3"	14 Ga. 1 ½" to 2 ½"
1/2"	3 ⅛" - 3 ½"	14 Ga. 1 ½" to 2 ½"
1/2"	3 ⅝" - 4"	14 Ga. 1 ½" to 2 ½"

Available in Groovestem or Superstem at no extra cost. Hot tinned or copper coated at no extra cost.

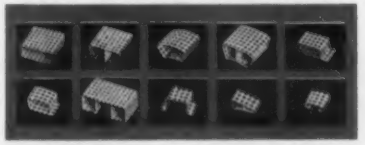
New FANNER CHAPLET

helps you select the right chaplet to assure

SIZE OF STEM	SIZE OF HEAD	GAUGE OF HEAD	LENGTH OF STEM
3/16"	1"	16	3" to 20"
1/4"	1 1/4"	16	3" to 20"
5/16"	1 1/2"	1/8"	3" to 20"
3/8"	1 3/4"	1/8"	3" to 20"
1/2"	2"	1/8"	3" to 20"
5/8"	2 1/2"	1/8"	3" to 20"
3/4"	2 1/2"	1/8"	3" to 20"

Available with Superstem or threaded stem at no extra charge.
Hot tinned or copper coated at no extra charge.

PERFORATED CHAPLETS



THICKNESS	L. x W.
1/8"	1/2" x 1 1/2"
3/16"	1/2" x 1 1/2"
1/4"	1/2" x 1 1/2"
1/8"	3/4" x 3/4"
3/16"	3/4" x 3/4"
1/4"	3/4" x 3/4"
3/8"	3/4" x 3/4"
1/8"	3/4" x 3/4"
3/16"	3/4" x 3/4"
1/4"	3/4" x 3/4"
3/8"	3/4" x 3/4"
1/2"	3/4" x 3/4"
5/8"	3/4" x 3/4"
3/4"	3/4" x 3/4"
3/16"	1" x 1"
1/4"	1" x 1"
3/8"	1" x 1"

THICKNESS	L. x W.
1/2"	1" x 1"
5/8"	1" x 1"
3/4"	1" x 1"
7/8"	1" x 1"
1"	1" x 1"
1/4"	1 1/4" x 1 1/4"
3/8"	1 1/4" x 1 1/4"
1/2"	1 1/4" x 1 1/4"
5/8"	1 1/4" x 1 1/4"
3/4"	1 1/4" x 1 1/4"
7/8"	1 1/4" x 1 1/4"
1/2"	1 1/2" x 1 1/2"
3/4"	1 1/2" x 1 1/2"
1"	1 1/2" x 1 1/2"
1/2"	2" x 2"
1"	2" x 2"

When ordering specify style, thickness of metal, length, direction of metal face, width. Give diameter of core when ordering curved chaplet.

SIZE OF STEM	SIZE OF HEAD	LENGTH OF STEM
1/8"	1/2"	3" to 20"
3/16"	5/8"	3" to 20"
1/4"	3/4"	3" to 20"
5/16"	1 1/4"	3" to 20"
3/8"	1 1/2"	3" to 20"
1/2"	1 1/2"	3" to 20"
5/8"	1 3/4"	3" to 20"
3/4"	2"	3" to 20"

Available with Superstem or threaded stem at no extra charge.
Hot tinned or copper coated at no extra charge.

SKIM GATES CORE TINS

SIZE INCHES	THICKNESS
1 x 1	.010
1 x 1 1/2	.010
1 x 2	.010
1 1/2 x 1 1/2	.010
1 1/2 x 2	.010
1 1/2 x 2 1/2	.010
2 x 2	.010
2 x 2 1/2	.012
2 x 3	.013
2 1/2 x 2 1/2	.017
2 1/2 x 3	.019
2 1/2 x 3 1/2	.022
3 x 3	
3 x 3 1/2	
3 x 4	
3 1/2 x 3 1/2	
3 1/2 x 4	
4 x 4	

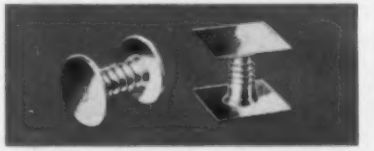
Skim gates are furnished in standard No. 2 perforations unless otherwise specified.

SIZE INCHES	THICKNESS
5/16	.008 to .012
3/8	.008 to .012
7/16	.008 to .012
1/2	.008 to .012
9/16	.015 to .020
5/8	.015 to .020
11/16	.025 to .035
3/4	.025 to .035
13/16	.025 to .035
7/8	.025 to .035
15/16	.025 to .035
1"	.025 to .035

Core tins are available in a wide variety of sizes and thicknesses. They are used to provide added bearing surface on the core against which the chaplet will press.

HEAVY DOUBLE HEAD CHAPLETS

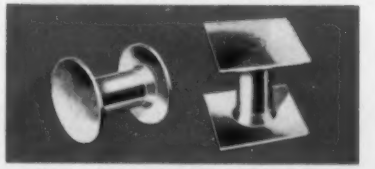
Riveted or Welded Plates – Round or Square



STEM SIZE	STEM LENGTH	SIZE OF HEAD – ROUND OR SQUARE
5/8" to 3/4"	1" and under	12 Ga. 1 1/2" to 2 1/2"
5/8" to 3/4"	1 1/2" – 1 1/2"	12 Ga. 1 1/2" to 2 1/2"
5/8" to 3/4"	1 3/4" – 2"	12 Ga. 1 1/2" to 2 1/2"
5/8" to 3/4"	2 1/4" – 2 1/2"	12 Ga. 1 1/2" to 2 1/2"
5/8" to 3/4"	2 1/2" – 3"	12 Ga. 1 1/2" to 2 1/2"
5/8" to 3/4"	3 1/4" – 3 1/2"	12 Ga. 1 1/2" to 2 1/2"
5/8" to 3/4"	3 1/2" – 4"	12 Ga. 1 1/2" to 2 1/2"

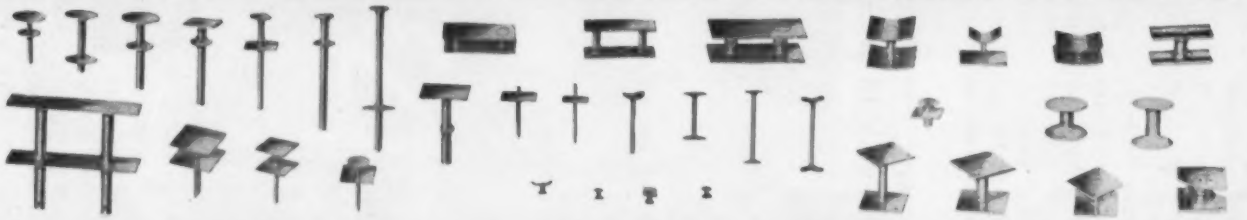
EXTRA HEAVY DOUBLE HEAD CHAPLETS

Riveted or Welded Plates – Round or Square



STEM SIZE	STEM LENGTH	SIZE OF HEAD – ROUND OR SQUARE
3/4" - 1" - 1 1/4"	1" and under	12 Ga. - 1/2" - 1/2" - 1 1/2" to 2 1/2"
3/4" - 1" - 1 1/4"	1 1/4" – 1 1/2"	12 Ga. - 1/2" - 1/2" - 1 1/2" to 2 1/2"
3/4" - 1" - 1 1/4"	1 3/4" – 2"	12 Ga. - 1/2" - 1/2" - 1 1/2" to 2 1/2"
3/4" - 1" - 1 1/4"	2 1/4" – 2 1/2"	12 Ga. - 1/2" - 1/2" - 1 1/2" to 2 1/2"
3/4" - 1" - 1 1/4"	2 1/2" – 3"	12 Ga. - 1/2" - 1/2" - 1 1/2" to 2 1/2"
3/4" - 1" - 1 1/4"	3 1/4" – 3 1/2"	12 Ga. - 1/2" - 1/2" - 1 1/2" to 2 1/2"
3/4" - 1" - 1 1/4"	3 1/2" – 4"	12 Ga. - 1/2" - 1/2" - 1 1/2" to 2 1/2"

SPECIAL CHAPLETS



THE FANNER MANUFACTURING COMPANY

BROOKSIDE PARK
CLEVELAND 9, OHIO

WALL CHART

sounder castings . . . more economically

SEND FOR FREE COPY 22" x 35" IN SIZE

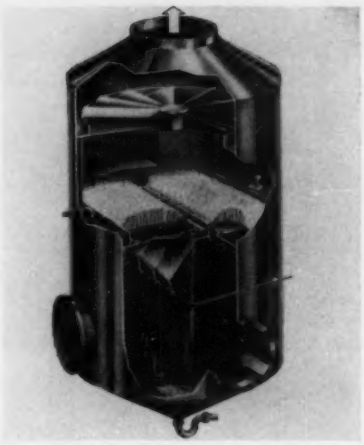
Another FANNER service to help you satisfy your chaplet requirements better, faster . . . at lowest cost. A type for every casting need. Send for your wall chart today.

for up to 6-in. cup wheels and 9-in. depressed center wheels. Features of the grinders include direct-acting governors; heavy duty bearings; four-bladed swastika-type motors; and hardened, ground, and honed cylinders for long life.—**Thomas C. Wilson, Inc.**, 21-11 44th Ave., Long Island City 1, N. Y.

For More Details Circle No. 465—Page 39

GAS SCRUBBER

Gas scrubber with single or multiple impingement plates is designed for wet cleaning, absorption, or cooling of gases. Operation of a typical unit begins when dust or fume-laden gas is drawn through the inlet under pressure. It passes upward through the humidifying spray and then is pulled through the perforated plate and divided into thousands of individual jets. All foreign matter is absorbed by water or

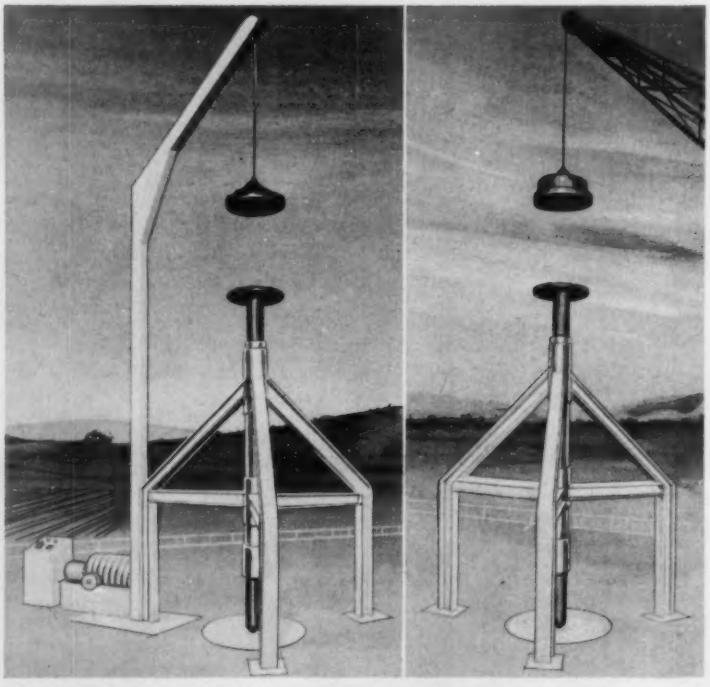


other liquid flowing over the plate as the jets strike the impingement surface above. The liquid carries foreign matter through an outlet while the cleaned gas passes through a mist eliminator.

A single-stage scrubber handles dust loadings at its inlet of up to 100 grains per cu ft and can have a pressure drop as low as 2½ in. while maintaining high efficiency. Liquid consumption is 1 to 3 gallons per 1000 cfm at 20-40 psig. —**W. W. Sly Mfg. Co.**, 4700 Train Ave., Cleveland 1, Ohio.

For More Details Circle No. 466—Page 39

Scrap Breaker Will Break 6-in. Cast Iron



Scrap breaker unit is designed to break rails or cast iron scrap up to 6 in. thick without notching. A standard model (right) uses the customer's own crane and magnet for power, as illustrated.

An integrated model also includes its own lifting device and magnet. Both units will deliver an impact of over 3 million psi, and they can be made to any size to accommodate breaking jobs of any type.—**Select Enterprises Inc.**, Wilmington, Ohio.

For More Details Circle No. 486—Page 39

SALT TABLETS

Salt tablets impregnated for controlled action are available in 500 or 1000-tablet dispensers of transparent plastic which allow visual checking. Dispensers are designed to keep out moisture and fumes, even while a tablet is being dispensed. They can be mounted on any wall or on trucks or other equipment.—**Medical Supply Co.**, Rockford, Ill.

For More Details Circle No. 467—Page 39

REPAIR CEMENT

Cement is for repairing minor defects in gray iron, malleable, and steel castings. It is claimed not to be affected by steam, water, oil, weather, or 400° F heat. The cement consists of a powder and a special mixing liquid which when mixed together set up by chemical action rather than evaporation. Setting time is approximately 5 minutes at 70° F, and maximum hardness is reached in 12 hours. Higher temperatures shorten the setting time.—**Northeast Metals Co.**, 4124 Torresdale Ave., Philadelphia 24, Pa.

For More Details Circle No. 468—Page 39

ALUMINUM PATTERN ALLOY

New aluminum alloy for making patterns is reported to minimize variations in shrinkage. Alloy composition has been adjusted to improve machinability and facilitate finishing operations such as filing and scraping. — **Federated Metals Div., American Smelting & Refining Co.**, 120 Broadway, New York 5, N. Y.

For More Details Circle No. 469—Page 39

CUPOLA PICKS

Cupola picks with heat treated nickel-chrome-moly steel heads and select hickory handles are available in two shapes and three weights. Specifically designed for use in application and maintenance of cu-

To a foundryman who wants to stay COMPETITIVE:

We'd like to help you.

You've spotted the trend. You've observed that customers are getting more demanding. That quality standards are heading higher. That competition is growing tougher.

You're aware that service, always important, is becoming more important than ever.

And you've decided that these facts spell opportunity—for the foundry that can adapt to them and make the most of them.

Shell molds and shell cores fit into this growth picture. We'd like to help you make the most of the business opportunities inherent in the shell process. There's a complete line of Durez® foundry resins to give you the results you want—consistently.

Just as important, there's a Durez man nearby who can help you use these resins to best advantage in your foundry. He talks your language. He wants to see you grow. Why not drop us a line today, and we'll have him pay you a visit.

STREAMLINE PRODUCTION of molds and cores. Modern shell-molding machines can produce a high-quality mold every 30 seconds. Shell cores let you get rid of wires, forget about core driers; save you a long baking cycle. Good collapsibility cuts shakeout time on intricate castings.

SAVE ON STORAGE SPACE—yet have plenty of molds and cores ready for rush orders. They're simple to store and there's very little risk of breakage. How much space could *you* save by stacking big cores like this?

DO LESS MACHINING (perhaps none at all) on castings that must meet close-tolerance specs. Get smooth bores in valves, engine blocks, pump parts—without grinding. Reduce the customer's machining cost by producing smooth, sand-free surfaces that machine faster, let tools last longer.

CUT HANDLING IN HALF or better. Shell molds and cores are light to lift, easy to handle. No hoist is needed even for a core this big.

DUREZ PLASTICS DIVISION

HOOKER CHEMICAL CORPORATION, 1007 WALCK ROAD, NORTH TONAWANDA, N.Y.

HOOKER CHEMICALS PLASTICS

For More Information Circle 586, Page 39

pola lining refractories, they replace makeshift, inadequate hammers and effect savings in time and effort.

Models available include 4½ and 6-lb single-end and 5-lb double end types. They are heat treated to Rockwell C 50/54 hardness with face and edges ground. Handles are 23 in. long over-all. Weights include handles.—**Industrial Equipment Co.**, 115 N. Ohio St., Minster, Ohio.

For More Details Circle No. 470—Page 39

RESCUE BREATHING KIT

Ambu kit is a light portable rescue breathing kit containing a resuscitator and a suction pump. It can be taken anywhere and can be put to work instantly because it requires no electricity or other connections. The resuscitator is operated by tipping the victim's head back, placing the mask over his face, and squeezing the bag. The bag holds up to 1000 cc of air and will deliver up to 700 cc into the lungs when squeezed. Because this amount is less than an adult's lungs will hold, there is no danger of rupturing tissues. The suction pump is foot operated and starts suction with the first step. It delivers enough suction to clear the mouth and throat of blood, mucous, vomitus, or other

liquid.—**American Optical Co.**, Southbridge, Mass.

For More Details Circle No. 471—Page 39

HEAT-RESISTANT GLOVES

Gloves are designed to protect worker's hands from the heat of hot shell cores or molds and from the radiant heat of heater plates. Made from heavyweight cloth, the gloves are offered in gauntlet or safety-cuff styles. A separate fleece-lined insert is available for extra heat resistance for exceptionally high core and mold temperatures. —**National Acme Co.**, 170 E. 131st St., Cleveland 8, Ohio.

For More Details Circle No. 472—Page 39

FIRE BRICK

Features claimed for new fire brick include light weight, high porosity, spall resistance, uniform surface textures, and accurate dimensions. Insulating properties are said to be excellent, and the brick can withstand direct exposure to flame and heat. Available in six types to cover maximum temperatures from 1600° F to 2900° F, brick is said to be virtually free of sulfur and to meet both ASTM and military specifications. A variety of sizes and shapes are offered as well as insulating mortars, castables, finishing cement, and block insulation.—**Kaiser Refractories & Chemicals Div., Kaiser Aluminum & Chemical Corp.**, 300 Lakeside Dr., Oakland 12, Calif.

For More Details Circle No. 473—Page 39

SURFACE PLATE FIXTURES

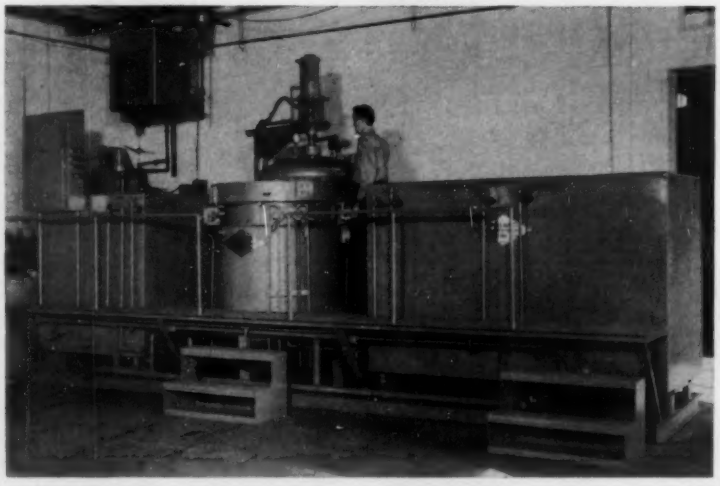
Fixtures for mounting special equipment on company's line of granite surface plates include threaded inserts, adapter holes, tee slots and dovetail slots for holding work or attaching indexing heads, bench centers, and similar equipment. Also available are precision graduated steel straight edges to aid in positioning and measurement of work. Fixtures can be located at any point on the surface plates as required.—**Herman Stone Co.**, 1860 N. Gettysburg Ave., Dayton 27, Ohio.

For More Details Circle No. 474—Page 39

STANDARD SAMPLES

Standard samples are for standardization and calibration of carbon and oxygen analysis equipment and

Autoclave Features Electrical Heaters

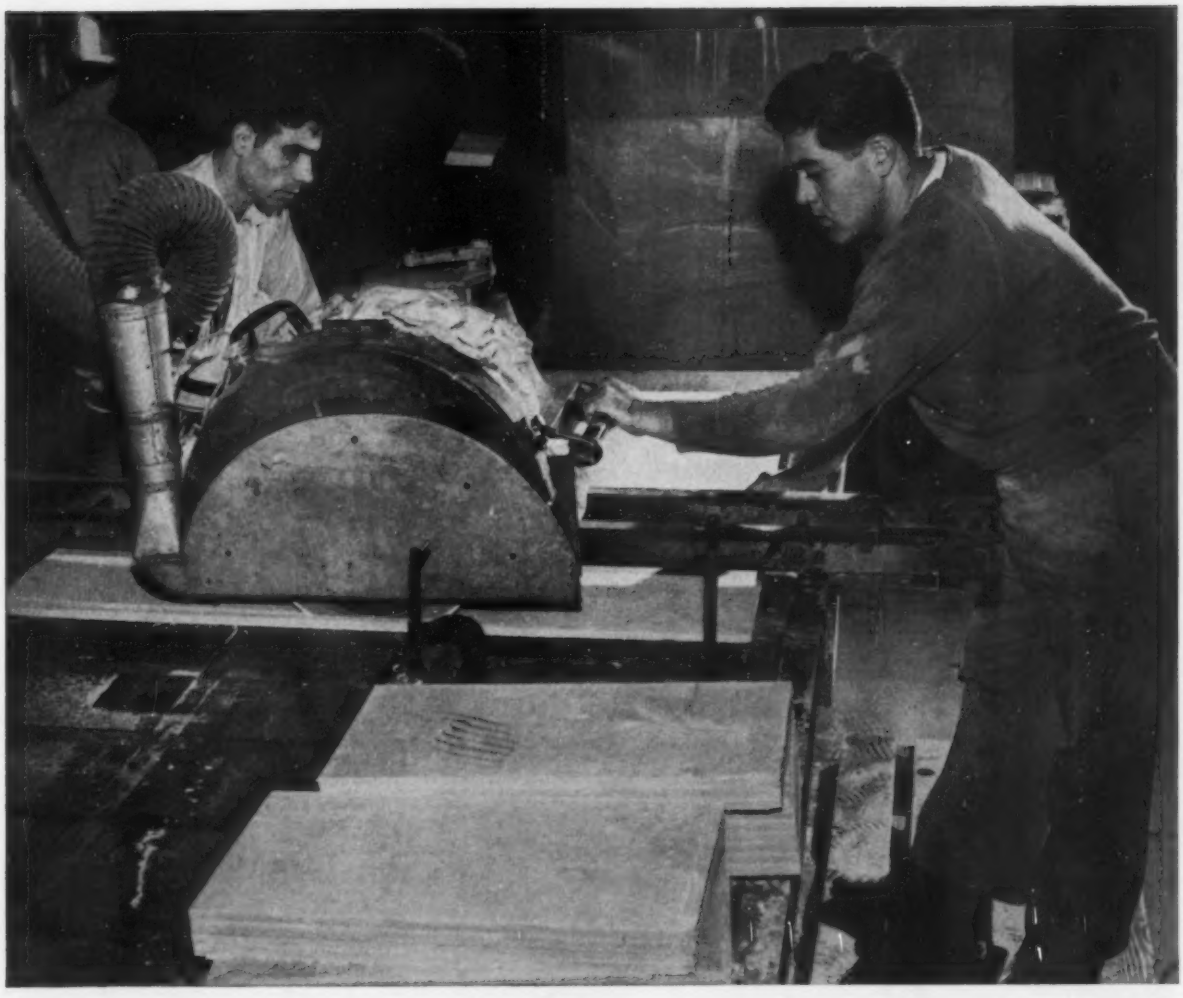


Model S-102-E impregnation machine features electric heating elements mounted in the sealant supply tank so that element burnout is eliminated and controlled by remote thermostats. Basically, the machine consists of a 325-gal working capacity autoclave, a 450-gal working capacity sealant supply tank, and separate hot and cold water rinse tanks, each of 400-gal capacity.

Electrical safety interlocks prevent cycling until the autoclave cover has been closed and locked. In addition, sealant cannot enter the vacuum system, and the cover cannot be opened before a safe pressure exists in the autoclave. An air cylinder with 3-in. diam piston rod raises and lowers the autoclave cover, and the forged cover locking ring is operated by heavy duty air cylinders.

A gas/liquid flow classifier prevents inadvertent pressure blow-back of air or gas through the process liquid, and a plug-type autoclave vent is provided for quick release of pressure in an emergency.—**Prenco Mfg.**, 2605 W. 14 Mile Rd., Royal Oak, Mich.

For More Details Circle No. 487—Page 39



Now... new, light-weight **TRANSITE® CORE PLATES** can be field-cut and shipped promptly to you!

Johns-Manville Research Engineers have now developed a new light-weight Transite Core Plate sheet stock which makes it possible for this sturdy asbestos-cement board to be cut locally by an authorized J-M cutter-rehandler and shipped to you promptly without further factory processing.

This quick service eliminates the danger of costly production delays due to slow deliveries. And the lighter weight means lower freight costs, too.

Transite Core Plates have proved themselves in hundreds of ferrous and non-ferrous foundries all over the country. Extremely strong, they resist shock and corrosion, will not crack or break under normal use. They maintain their smooth, level surface year after year with a minimum of wear.

FREE FOLDER GIVES COMPLETE DETAILS

Whether or not you now use Transite Core Plates, there are many rewards to be had from a careful study of J-M folder IN-219A. It gives complete specifications on weights, sizes and thicknesses. And, for the address of your local authorized J-M cutter-rehandler, write Johns-Manville, Box 14, New York 16, New York. In Canada: Johns-Manville, Ltd., Port Credit, Ontario. Cable address: Johnmanvil.

JOHNS-MANVILLE JM

Johns-Manville, Box 14, New York 16, N. Y.
(In Canada: Port Credit, Ontario)

Please send me booklet IN-219A at no cost or obligation to me.

NAME_____ TITLE_____

FIRM_____

STREET ADDRESS_____

CITY_____ ZONE_____

COUNTY_____ STATE_____

For More Information Circle 587, Page 39

Stub at right shows typical waste with conventional cutting carbons; piece at left shows small amount of waste with Kostkutter Rods.

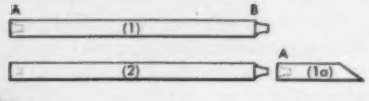
"Speer's new KOSTKUTTER RODS* save us between 18 and 25% over conventional cutting carbons," *says Joseph P. Fucci, General Foreman, Erie Forge & Steel Corporation, Erie, Pa.*

Kostkutter Rods can save *you* money too. Their revolutionary design, a Speer development, allows the joining of the 2½ inches "waste," which would normally be thrown away, to the front of the next rod for further use. Thus, stub loss is virtually eliminated. In addition, Kostkutter Rods make possible further savings by reducing torch damage, since it is no longer necessary to economize by burning carbons close to the clamp. By joining on a new rod, the hot spot can always be kept at a safe distance from the clamping device. The additional "leftover" carbon is used up with the next rod. Kostkutter Rods are copper plated (except the tapered sections) after shaping the rod ends, thus insuring perfect contact between rods.

Kostkutter Rods are available only from Speer. Buy them in diameters of ½", ⅝", ¾" and 1". Standard cutting carbons are also available at slightly lower prices. *Patent applied for

How Kostkutter Rods Save You Money

Each Kostkutter Rod has a tapered hole in one end (A) and a tapered projection at the other end (B) as shown in Diagram 1. The rod is clamped into the torch and used in the normal way. The stub end (Diagram 1a) which, with conventional cutting carbons would be wasted, is removed from the torch and attached to the end of a new Kostkutter Rod (Diagram 2). The tapered end of the new rod slips easily into the tapered hole at the end of the stub and is held firmly by friction. The new rod, with the stub attached, is then clamped into the torch and practically the entire stub is used up instead of being discarded.



SPEER Carbon Co

Carbon Products Division • St. Marys, Pa.

graph preparation for conductometric carbon and oxygen determinations. Samples consist of high purity compounds encased in tin capsules and ready for use without weighing. Each sample can be used for either carbon or oxygen analysis. —**Laboratory Equipment Corp.**, St. Joseph, Mich.

For More Details Circle No. 475—Page 39

ILLUMINATED MAGNIFIER

Illuminated magnifier, as illustrated, is for fine inspection work requiring magnification. Both battery and electric units are produced,

and component parts on all models are interchangeable. A Henry disc with hairline across its diameter fits into the bottom housing on 5X and 7X models.—**E. W. Pike & Co.**, 711 Pennsylvania Ave., Elizabeth, N. J.

For More Details Circle No. 476—Page 39

FORK LIFT TRACTOR

Heavy duty fork lift tractor features four-wheel drive, pressure-controlled system for hydraulic lifts and tilts, dual foot-brake pedals, and slope-down front. Rear (steering) axle mounting permits full axle oscillation of 18 degrees. Designed for rugged outdoor applications, it has a 6000-lb capacity at 24-in. load center and 14-ft maximum stacking height. This unit also is available with a 21-ft lift height mast at reduced capacity, and it can be converted to a tractor shovel with bucket.—**Frank G. Hough Co.**, 703 Seventh St., Libertyville, Ill.

For More Details Circle No. 477—Page 39

AIR COMPRESSORS

Line of intercooled centrifugal compressors, Type VC, has been redesigned to provide water cooling between all stages. Units are for applications requiring 60 to 125 psig pressure and are available in capacities from 5000 to 60,000 cfm. Standard air-to-water heat exchangers cool the air stream passing through the compressor. Intercoolers are mounted after each impeller, both in the upper and lower half of the machine's single horizontally split casing. — **Allis-Chalmers Mfg. Co.**, Milwaukee 1, Wis.

For More Details Circle No. 478—Page 39

ALUMINA REFRACTORY

High aluminum refractory, Korundal XD, features high density, low porosity, and high strength. Tested at 3000° F, it shows no tendency towards subsidence or spalling. It has been used successfully in contact with iron slags, as skid rails in slab heating furnaces, as kiln furniture, and in checker chambers. Proposed uses include linings in electric furnace roofs.—**Harbison-Walker Refractories Co.**, 307 Fifth Ave., Pittsburgh 22, Pa.

For More Details Circle No. 479—Page 39

ABRASIVE CUTOFF UNIT

New abrasive cutoff unit, Model No. 11, cuts up to 3-in. shapes and

1½-in. solids. It uses a wheel 11 in. in diam with a 1-in. bore. A screw-type positive clamping vise holds work securely while it is cut. The unit weighs 136 lb and stands 21½ in. tall. It can be mounted on a stand or a workbench.—**Abrasive Machine Div., Beaver Pipe Tools Inc.**, Warren, Ohio.

For More Details Circle No. 480—Page 39

LIMIT SWITCH

Limit switch is an open precision unit with snap action. Available with one normally open, one normally closed, or one normally open and one normally closed contact, switch is offered with either plunger or roller lever operators. It is rated for ac up to 40-amp make, 15-amp break, and for dc up to 2-amp make and break on single-throw forms with 0.040 gap. Single - throw switches are suitable for ½ hp on 115 or 230 v dc. All forms are available from 110 to 600 v.—**General Electric Co.**, Schenectady 5, N. Y.

For More Details Circle No. 481—Page 39

BIN WALL LUBRICANT

Bin Slick is a graphite-fortified resin paint for coating and lubricating sand bins, conveyors, coreboxes, and patterns so that sand will not stick to these surfaces. The material protects the surface, gives a stickproof base for the sand to slide on, and holds funneling of sand in a bin to a minimum. One gallon of the material covers approximately 700 sq ft.—**Vince Bruce Inc.**, 5345 Lexington Ave., Indianapolis 19, Ind.

For More Details Circle No. 482—Page 39

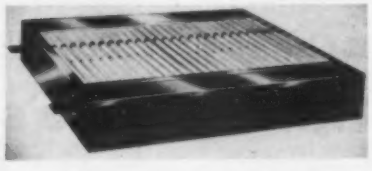
SPIEGEL PIG

Company's spiegel pig for the foundry now is produced to a closely controlled weight so that there is an average of 2 lb of manganese per pig. The 10-lb pigs are said to be economical for making manganese additions in gray and malleable iron.—**New Jersey Zinc Co.**, 160 Front St., New York 38, N. Y.

For More Details Circle No. 483—Page 39

INFRARED FURNACES

Infrared furnaces for high-speed annealing now are offered following development of fluid cooling for compact quartz lamp radiant heat units. Features of this new



equipment include high heat transfer rates, precision control, and elimination of contamination during processing. Almost any shape of equipment may be fabricated to meet nearly any requirement for temperatures up to 3000° F or for short cycles.—**Fostoria Corp.**, Box 100, Fostoria, Ohio.

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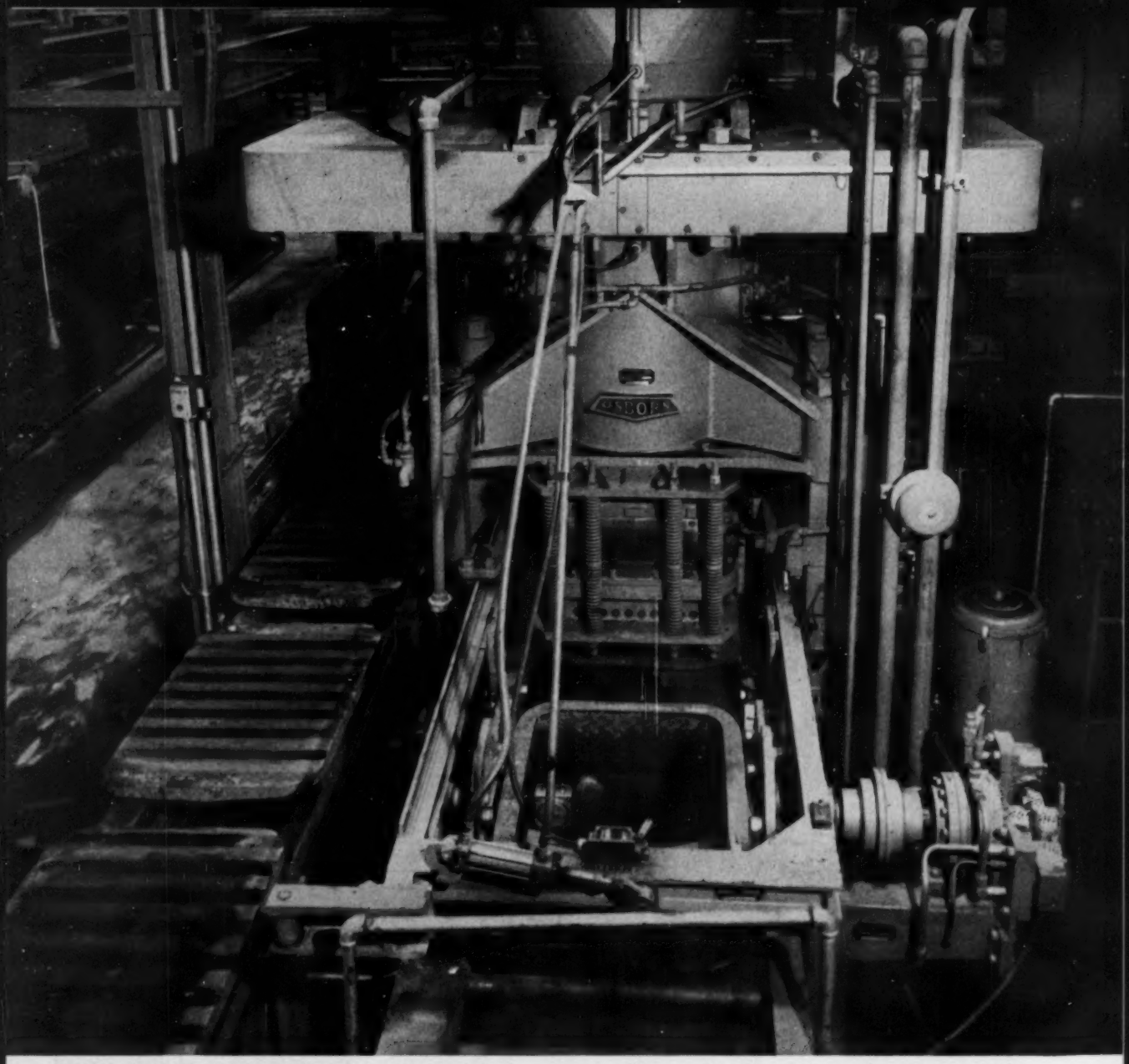


OSBORN SERIES "M" AUTOMATIC MOLDING MACHINE produces cope and drag molds in this new mechanized bronze foundry at Neptune Meter Co., Maspeth, N.Y. As booked flasks come from punchout, operator manually removes cope, places it on conveyor to cope molding machine. Drag flask seen above is automatically conveyed and rolled over for indexing into drag molding machine. After drag mold is blown, filled flask is rolled over and returned to drag mold conveyor for coring . . . all automatically.

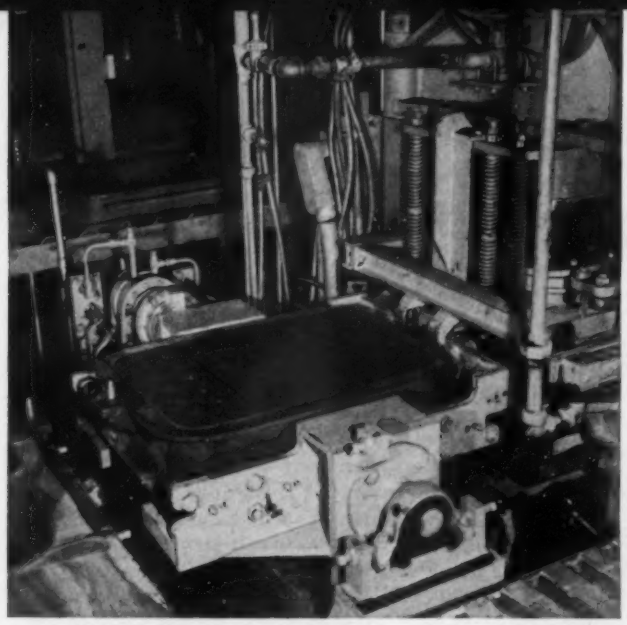
■ *Osborn Field Report*

How Neptune's modern bronze foundry expects to reduce mold production costs

This modern, mechanized molding line recently went into operation at the new bronze foundry of the Neptune Meter Company, an important manufacturer of liquid metering equipment. Neptune expects to sharply reduce its unit cost of producing molds.

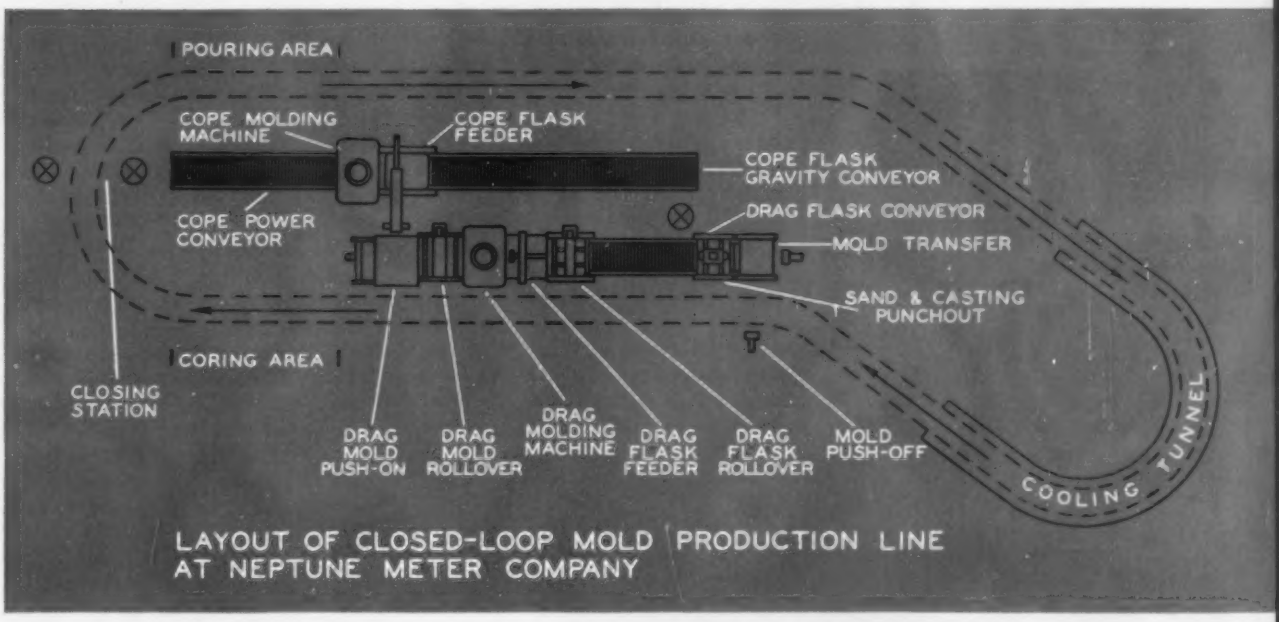
The new layout—Osborn-equipped—is designed for an initial capacity of 240 cope and drag molds per hour. Key units are two Osborn Series "M" Automatic Molding Machines. One machine handles cope production while the other rams the drag.

A major portion of Neptune's foundry production (the water meter covers and housings comprising



EXTREMELY SHARP MOLD DEFINITION results from high pressure hydraulic squeeze of Osborn Series "M" equipment. Molds on this machine can be rammed to a uniform hardness of 85-95 depending on job requirements.

COMPLETED COPE MOLDS move out of Osborn Series "M" Automatic Molding Machine on conveyor to closing station. Using a bale, two operators close the cope over the cored drag. The Neptune layout can be converted at a later date to fully automatic operation.



LAYOUT OF CLOSED-LOOP MOLD PRODUCTION LINE AT NEPTUNE METER COMPANY

Neptune's "bread and butter" line) is handled here. Extensive mechanization with Osborn equipment will mean an efficient, high production molding line requiring only three men, plus core setters and pourers as needed. The Neptune layout can be converted to fully automatic operation.

From a profit standpoint, Neptune's short-run production demands equipment that is versatile and flexible—machines that can run dependably shift-after-shift with minimum maintenance and downtime. Neptune selected *Osborn Automatic Molding Machines* to provide for a steady flow of superior molds for high quality bronze castings.

If you're looking for ways to increase productivity . . . boost efficiency . . . improve your profit margin —we can show you why it *pays to mechanize* with advanced Osborn foundry production machinery and methods. Write or call us *today*.

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For More Information Circle 589, Page 39

Malleable Founders Discuss

MANAGEMENT PROBLEMS

ROBERT S. BRADSHAW
President

JOSEPH B. GUTENKUNST
Vice President

By FRANK G. STEINEBACH
Publisher and Editorial Director

● HOW ARE WE making out with our society's activities? What are the potentials for the future growth of the industry? Discussions of these vital problems featured the annual meeting of the Malleable Founders Society at the Broadmoor, Colorado Springs, Colo., June 7-9.

The answer to the first question was reassuring. Committee chairmen, society officers, and staff members pointed out that the society's research program is developing extensive data of value in the fields of machining malleable iron, stress-rupture characteristics, solidification of malleable iron, and the application of a number of processes and materials as they fit into malleable iron production. The 1961 T & O conference had an exceptionally good attendance from a large number of companies.

The society publicity program has resulted in articles of major significance in leading business publications. Distribution of *Malleable Iron Facts* has been increased to 12,000, and the *Handbook*, published last year, has had a gratifying sale. The 1961 Market Development Conference will be held in the fall.

A Financial Management Conference was held in Chicago to develop a better understanding of what types of financial reports are of real value to management in the operation of the company. A Mechanized Foundry Subcommittee is making a special study of the influence of specific factors in cost estimating.

These and other activities were mentioned in the report of the president, Charles P. Speitel, president, Pennsylvania Malleable Iron Corp., Lancaster, Pa., and in more detail by the following committee chairmen: P. C. DeBruyne, Moline Malleable Iron Co., St. Charles, Ill., chairman of the Finance Committee; T. F. Slattery, Federal Malleable Co., Milwaukee, chairman of the Accounting Committee; Roy C. Hobson, National Malleable & Steel Castings Co., Cleveland, chairman of the Government Affairs Committee; Joseph Abusamra, Belcher Malleable Iron Co., Easton, Mass., chairman of the Membership Committee; and Thomas M. Blank, Pennsylvania Malleable Iron Corp., Lancaster, Pa., chairman of the Research and Technical Committee.

Future Plans—Further information on society plans for future activities was announced by the newly elected president, Robert S. Bradshaw, president and general manager, Texas Foundries Inc., Lufkin, Tex. He emphasized the importance of the recently appointed Program Appraisal Committee, which will study and make recommendations on all society activities. Mr. Bradshaw also reported that the society will undertake a substantially increased research program and will set up a production

Harvey E. Steinhoff, Wagner Castings Co., left, receives the society's McCrea Medal for his work. It was presented by Leon J. Wise, Chicago Malleable Castings Co.

development program, utilizing consultants work for the present.

Members of the society, in panel discussions, and one speaker indicated that the industry's future potentials are good, but necessarily depend on vision and long-range planning of management.

Harry E. Figgie Jr., president, Booz, Allen Methods Service Inc., Cleveland, stated that the foundry industry is a mature industry. Such industries can be characterized by a declining market, excess capacity, dangerous price competition, and profit deterioration. He stressed the need for contact with the engineering departments of foundry customers to see that malleable castings are used on new products. This is especially true since foundry customers report that much of their future growth will be in new products.

Mr. Figgie suggested diversification through product acquisition or through research and development. He emphasized the need for cost reduction and advised the industry to cease using capital expenditures as a crutch.

Looking to 1970 — The panel, which discussed "Hitting the Target" in 1970, consisted of Mr. Bradshaw; Mr. Hobson; Collins L. Carter, Albion Malleable Iron Co., Albion, Mich.; Roger W. Griswold, Erie Malleable Iron Co., Erie, Pa.; and Leon J. Wise, Chicago Malleable Castings Co., Chicago. The theme that ran through the panel discussion was that malleable iron is an excellent product that has been undersold, that better management planning is needed, that greater attention should be given to knowing costs, and that the industry's house must be put in order through modernization, improved practices, cost reduction, and better customer relations.

Another look at the future was provided in a dramatic skit entitled "Through the Rear View Mirror." The scene was a press conference in 1970 at which Thomas A. Scanlan, Eastern Malleable Iron Co., Naugatuck, Conn., and the president of MFS in 1970; Lowell D. Ryan, executive vice president, MFS; and Hans J. Heine, technical director, MFS; were interviewed by Frank G. Steinebach of FOUNDRY.

The sketch brought out that although some markets for malleable castings had undergone radical changes in the Sixties, the industry, through technical developments, an improved product, cost reductions, a hard driving marketing program which included excellent advertising and promotion, and a search for new markets, had expanded the sale of malleable castings.

New officers for the coming year are as follows: President, Mr. Bradshaw; vice president, Joseph B. Gutenkunst, president - treasurer, Milwaukee Malleable & Grey Iron Works, Milwaukee; executive vice president and secretary, Lowell D. Ryan; treasurer, Thomas E. Butz, president, Fanner Mfg. Co., Cleveland.

Harvey E. Steinhoff, director and vice president of sales, Wagner Castings Co., Decatur, Ill., was presented the McCrea Medal of the society for his contributions to the progress of the industry and the advancement of malleable technology, including his work as chairman of the Handbook Committee which resulted in the publication of *Malleable Iron Castings* by the society in 1960. The medal was presented by Mr. Wise.

COUNCIL MEMBERS MEET

Members of the Malleable Castings Council, in a meeting on June 9, received interesting reports of preliminary results of the malleable castings advertising and promotion program of the Council.

Reports were made by president Joseph B. Gutenkunst, president-treasurer, Milwaukee Malleable & Grey Iron Works, Milwaukee, and Lowell D. Ryan, assistant secretary. Many members commented on the value of the program to their companies and stressed the importance of continuing the activity. Recommendations of the Steering Committee for the Council's advertising program for the new year beginning Nov. 1 will be submitted to council members for consideration later in the summer.

Officers for 1961-62 are as follows: President, Thomas J. Kirby, vice president, sales, Northern Malleable Iron Co., St. Paul; vice president, L. D. Auker, sales manager, Alloy Foundries Div., Eastern Malleable Iron Co., Naugatuck, Conn.; secretary, Bruce Allen, Dayton Malleable Iron Co., Dayton, Ohio.; treasurer, Joseph S. Hornstein, Meadville Malleable Iron Co., Meadville, Pa.

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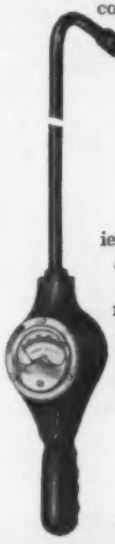

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INDUSTRY BRIEFS

Reynolds Metals Co., Richmond, Va., will expand its cast house at the Sheffield, Ala., plant at a cost of more than $2½ million. The expansion will include installation of two holding furnaces with 80,000-lb capacity which will be paired with two 100,000-lb melting furnaces. To house the new furnaces and related equipment, a 175 x 140-ft extension of the cast house will be built. It will be about 6 stories high.

Universal-Rundle Corp., Milwaukee, which terminated operations last year, has been purchased by Daniel and Fred Richman, Cleveland. The new owners plan to modernize the buildings on the 11-acre site, but will liquidate excess machinery and equipment.

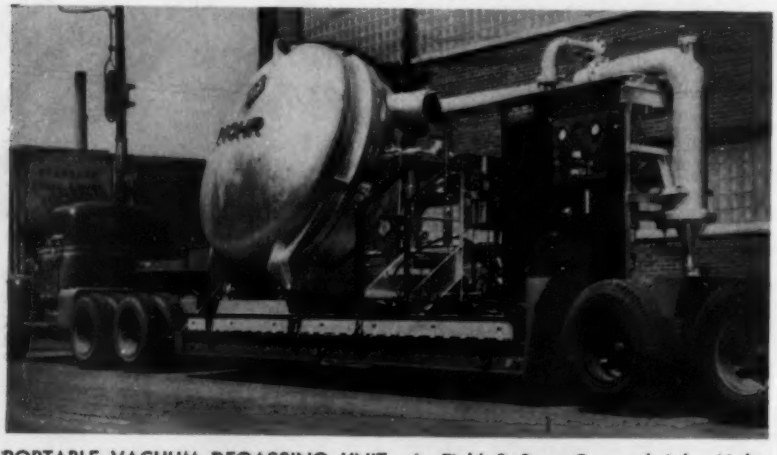
G. E. Smith Inc. has moved to newer and larger headquarters at 4 W. Manilla Ave., Pittsburgh 20, Pa.

Magnesium Alloy Products Co., Compton, Calif., has negotiated a licensing agreement with Metallurgical Associates, Boston, Mass., to produce aircraft quality aluminum castings under the trademarked Ductaluminum process developed by the latter company.

Taccone Corp., North East, Pa., has shipped an automatic, high-speed molding machine via the St. Lawrence Seaway to Halbegerhutte, Brebach-Saar, Germany, a large producer of ferrous soil pipe fittings. The molding machine, which weighs 100 tons, features integrated mold handling and will produce uniform, high-density green sand molds for thin-walled castings.

Straight Line Foundry & Machine Corp., Syracuse, N. Y., terminated foundry operations as of June 30. Officials of the 81-year-old firm were attempting to sell it as a continuing organization rather than to dispose of the assets on a piecemeal basis.

Springfield Aluminum Plate and Casting Co., Springfield, Ohio, has begun a $150,000 expansion program which will include a one-story building addition to be used for die-casting and permanent mold casting. The foundry, a division of Holophane Co., New York, expects to occupy the new building by Oct. 1.



PORTABLE VACUUM DEGASSING UNIT: A. Finkl & Sons Co. and John Mohr & Sons, Chicago, combined efforts to produce the portable degassing unit shown leaving the Finkl plant. It will be transported by truck to foundries which want to try vacuum degassing with their operations. The front of the chamber opens in clamshell fashion to accept a 2½-ton ladle of molten metal. A complete degassing cycle is completed in about 10 minutes, including producing a high vacuum by means of a steam jet inside a venturi

National Malleable and Steel Castings Co., Cleveland, and Metalúrgica Peruana, S. A., Lima, Peru, have completed arrangements whereby National Malleable will provide the South American company with technical and engineering assistance in the construction of a foundry near Lima, Peru, for iron, steel, and nonferrous castings. Initial annual capacity is to be 20,000 tons.

Werner G. Smith Inc., Cleveland, has appointed Ray Marthens Co., Moline, Ill., to be its sales representative for core oils and release agents in western Illinois, northern Missouri, and eastern Iowa.

Air Reduction Co., New York, will acquire the assets and business of Speer Carbon Co., St. Marys, Pa., subject to the approval of each company's board of directors and Speer Carbon stockholders. The agreement calls for exchange of one share of Air Reduction common stock for each 2¼ shares of Speer Carbon stock. Speer would continue operation in the same location and under present management.

American Steel Foundries, Chicago, has sold the Elmes & King Div., Cincinnati, to Elmes & King Mfg. Co., a corporation headed by Flug & Strasser Associates, New York. The company is a producer of machine tools.

Picker X-Ray Corp., White Plains, N. Y., has formed the Picker Special Products Div. to design and produce individualized nondestructive testing systems for industry. Donald T. Green, chief industrial applications engineer, has been named manager of the division, which will be situated in Cleveland.

Ajax Magnethermic Corp. has purchased 50 per cent of the stock of Safety Electrical Equipment Corp., New Haven, Conn. The other 50 per cent was purchased by a group headed by Robert Dodds, present executive vice president, and John Kennedy, present vice presi-

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HOW TO DO IT

Automatic Switch Prevents Plugging Of Bucket Elevator Sand System

By HOWARD T. BAILEY
Universal Foundry Co.
Oshkosh, Wis.

SAND HANDLING system shutdowns due to plugged bucket elevators are a costly interruption of production. Slippage of the elevator belt against the drive pulley is a frequent cause of the trouble. When the pulley slips, the elevator runs slowly or not at all. The sand feed conveyor continues to supply sand to the elevator and plugging results.

We eliminated this cause of plugging in our foundry by connecting a rotating switch to the idler pulley of the elevator with a piece of ordinary air hose. As shown in the photo, the hose forms a flexible drive shaft to the switch. The contacts of the switch are connected in series with the electrical circuit of the sand feed conveyor and are closed during normal operation as the idler pulley rotates. If the elevator drive pulley slips and the idler pulley stops turning, the contacts on the switch open, and the sand feed conveyor stops.

Have any ideas of your own? FOUNDRY will pay a minimum of $15 for each "How To Do It" item submitted and published

dent. Safety Electric employs 300 persons and manufactures motor generators, control devices, and other electrical equipment.

Rotor Tool Co., Cleveland, has formed the Rotor Tool Co. of Canada Ltd., a wholly owned subsidiary of Rotor Tool Co. and an affiliate of Cooper-Bessemer Corp. of Canada Ltd. The new Canadian company will manufacture, sell, and service Rotor Tool products in Canada.

Central Foundry Co., Holt, Ala., has entered preliminary merger negotiations with MSL Industries. Central Foundry Co. produces cast iron soil pipe.

Hyster Co., Portland, Oreg., has appointed Martin A. Ceder Inc., 2520 W. Market St., Louisville, Ky., to sell its industrial trucks in Kentucky and in a 14-county area in Indiana, bordering on the Ohio River.

Whitehead Metals Inc., a subsidiary of International Nickel Co., has opened a new sales office and warehouse in Baltimore. Whitehead will expand its inventories of nickel, nickel alloy, aluminum, copper, and brass sheet, rod, pipe, tubing, wire, valves, fastenings, wire mesh, shot, and ingots for delivery in Maryland, the District of Columbia, and Virginia.

Willson Products Div., Ray-O-Vac Co., Reading, Pa., has appointed Richardson Supply Co., 814 W. 17th St., Kansas City, Mo., to be a franchise distributor for its safety products in the Kansas City area. Richardson Supply Co. was established as successor to the L. R. Stone Co.

Leeds & Northrup Co., Philadelphia, has opened a new office in Birmingham to serve Alabama, Mississippi, and those parts of Tennessee and Florida in the Central Time Zone. Daniel J. McKiever is manager.

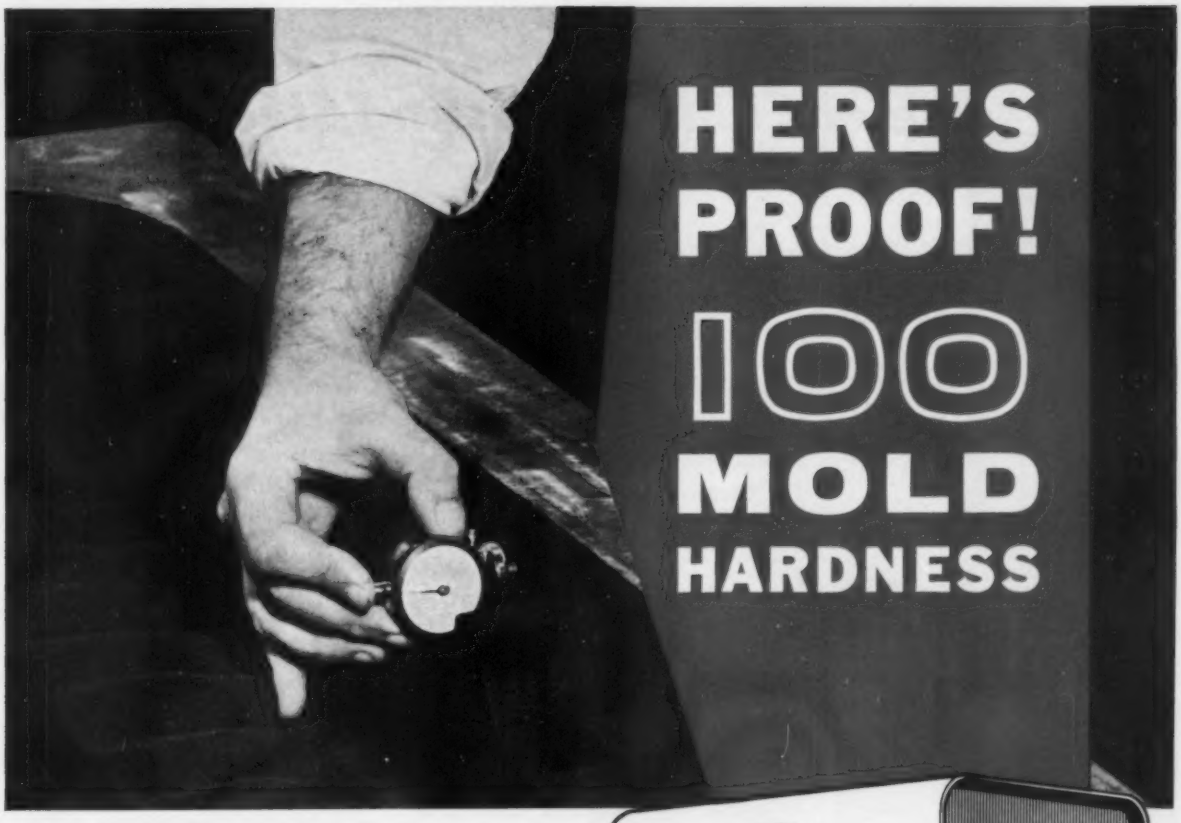
Stamford Fan Co., 47 Cedar St., Stamford, Conn., has been organized to manufacture and sell a complete line of commercial and industrial fans and blowers. Research, design, and manufacturing of the line will be handled at the plant of Sedgwick Machine Works Inc., Poughkeepsie, N. Y.

Stauffer Chemical Co., New York, has licensed National Research Corp., Cambridge, Mass., to operate electron beam melting and casting furnaces. Electron beam processing is used to produce commercial quantities of high-purity refractory metals.

Philadelphia Quartz Co., Philadelphia, is celebating its 130th anniversary this year. The company was founded as Joseph Elkington & Son in 1831 and took its current name in 1864.

Warwick Industrial Furnace & Engineering Corp., designer and builder of nonferrous melting furnaces, has moved to a newly constructed building at 9219 Parck Ave., Franklin Park, Ill.

Perfect Circle Corp., Hagerstown, Ind., has acquired Schellens True Corp., Ivoryton, Conn., producer of turbine blades and wheels for jet engines, gas and steam turbines, compressors, blowers, pumps, and auxiliary equipment. Schellens True will be a wholly-owned subsidiary of Perfect Circle and will be operated by its present management. Immediate expansion is anticipated.



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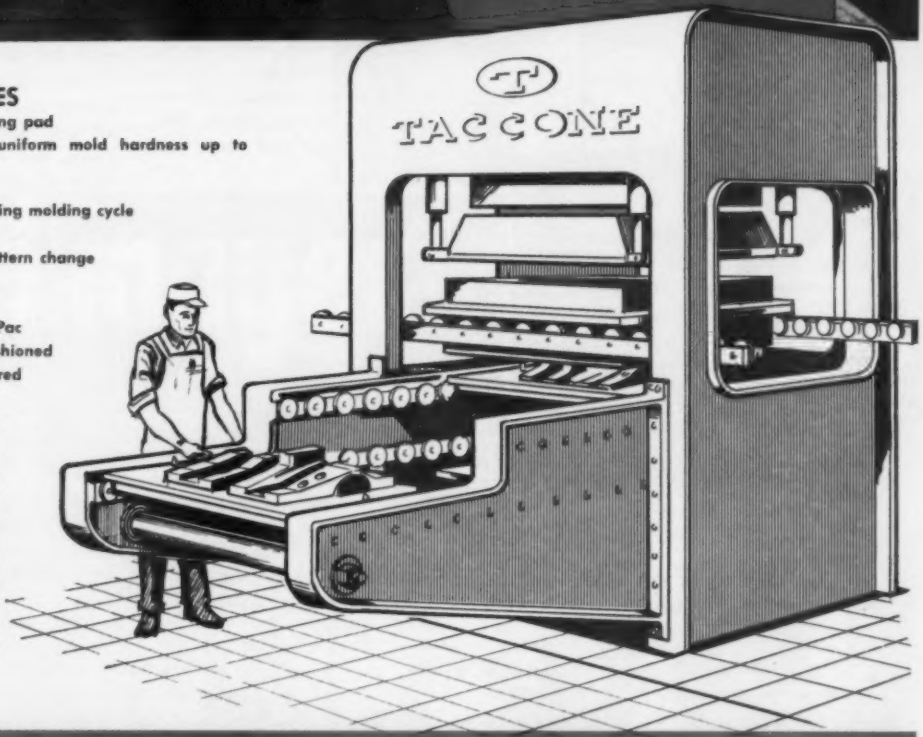

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TACCONE Hydra-Pneumatic Mold Machine with Pattern Shuttle Equipment

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Use of Chills In Casting Steel

By THOMAS E. RIEGER
Assistant General Manager
Pacific-Southern Foundries Inc.
Bakersfield, Calif.

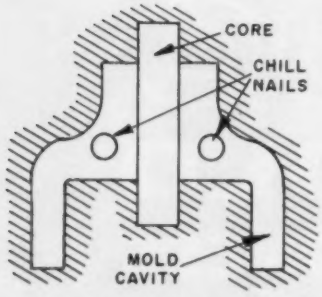


Fig. 1—Internal chills are used where they do not interfere with areas that must be pressuretight

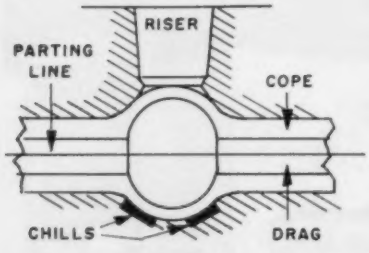


Fig. 2—Crotch chills are used in large castings to set up end zones between two feed risers

● CHILLS commonly are used to control metal solidification in casting steel. Much has been written about chilling and its effect on solidification, but knowledge of a few basic facts is essential when use of chills is contemplated. They are composition, size and shape, location, and type.

Composition—Various materials have been employed successfully for chills but normally carbon steel is used. It can be cast to any shape and is economical in that the chills can be used many times before being discarded. Internal chills, when used for alloy castings, should be of the same material.

Weld rod, a good and readily available material for chills, also can be cast by making a dummy green sand mold and stabbing it with different size rods up to ½ in. diam and about 6 in. deep. These molds can be poured as pig at the end of an alloy heat and the rods used for chills.

Size and Shape—Steel chill thickness never should be more than three-fourths of the thickness being chilled. The width and breadth of a chill can be determined only by common sense and experience. Excessive chills can cause misruns, cold shuts, etc., resulting in an unacceptable casting.

Location—No two foundries will chill the same casting in the same way. One must keep in mind what he is trying to accomplish with the chill. Chills, when used properly, and in the correct location, can increase the casting yield considerably. The chill location normally will be either over a heavy section or set up as an end zone so that the feeding distance from the riser will be effective.

Chill Types—Two basic types of chills are used: Internal and external. With discretion and a knowledge of customer requirements, either one or both can be used on the same pattern.

Internal chills are used only where they do not interfere with an area that must be pressure tight. They are used in ribs and junctures of different metal sections.

External chills are used in many different ways. They include bowl chills, crotch chills, flange chills, core chills, and brackets. Bowl chills are placed only in the drag, the others in cope and drag.

Bowl chills are used on all large valve body castings. An open riser is in the cope and from one to six bowl chills are set in the drag, depending on casting size. Chills should be of uniform section where possible and practicable. The chills should not be butted together but rather spaced a minimum of 1½

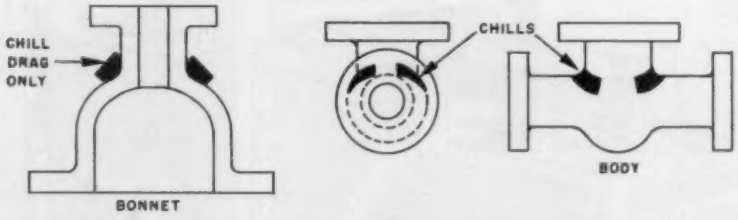


Fig. 3—Flange chills are used where it can be calculated that the riser or risers will not feed adequately to assure a sound casting

Fig. 4—Core chills are used primarily to eliminate the possibility of bore cracks

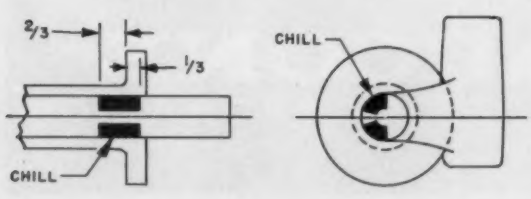
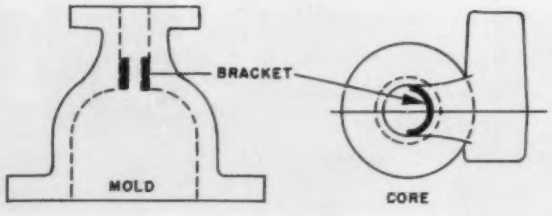


Fig. 5—Brackets are used as chills at heavy sections or across riser contacts to avoid tears



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★ Rack Type Core Baking Ovens

★ Vertical Core Ovens

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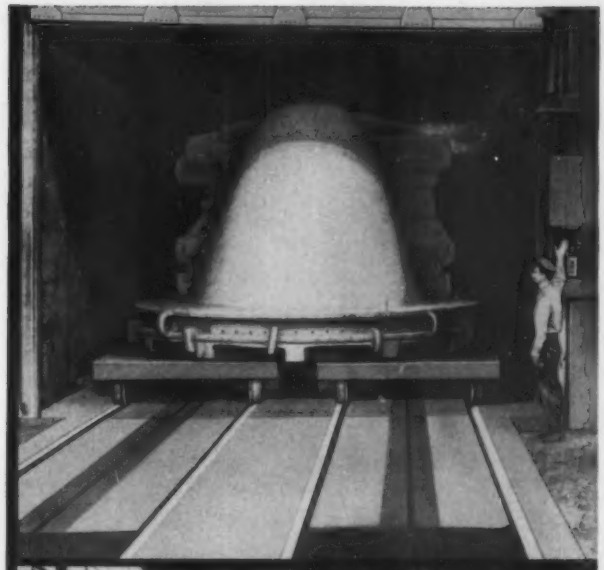
Write for Bulletin 53-CM



TOP RIGHT—This large car type mold oven is installed at Pittsburgh Steel Foundry. Its special triple slotted panel construction reduces heat loss 1/3. Fuel savings up to 50% over old conventional methods are possible. Drying time is often cut in half and temperatures are uniformly controlled.

MIDDLE RIGHT—This rack type core baking oven is at the Fremont Foundry Co., Fremont, Ohio. It is equipped with a recirculating combination gas-oil fired heating system.

BOTTOM RIGHT—Vertical Core Oven (unloading position) at A. C. Williams Company, Ravenna, Ohio. This oven is 11'-0" wide x 11'-0" deep x 45'-0" high.

BELOW—Car type mold drying oven installed at Centre Foundry, Wheeling, West Virginia.

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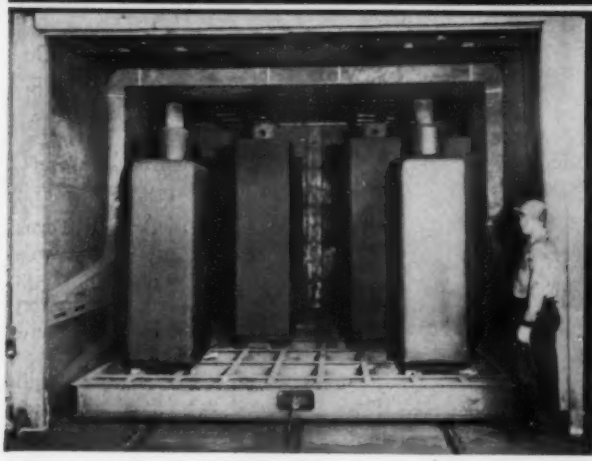

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in. apart to prevent any cracking between the chills.

Core chills, as shown in Fig. 4, are used for one main purpose. They practically eliminate the threat of bore cracks. The chill is one-third in the flange and two-thirds in the wall section. Core chills always are placed opposite the riser, either in the cope and drag or drag only.

Brackets are placed in the core or the mold as chills at heavy sections or across the riser contacts to do away with the possibility of tears.

The brackets should not be more than $\frac{1}{8}$ in. wide or $\frac{1}{4}$ in. deep. They act the same as cooling fins in helping to dissipate the high heat concentration.

Keep Them Clean—Care of chills is important. Rusty or dirty chills can cause as much scrap loss as a batch of below par molding sand. A preferred technique is to blast the chills clean, dip them in a protective coating, and light them off with a torch to insure that they will be completely dry. Proper storage should keep them in this condition until used.

Saw Blade Standards Revised

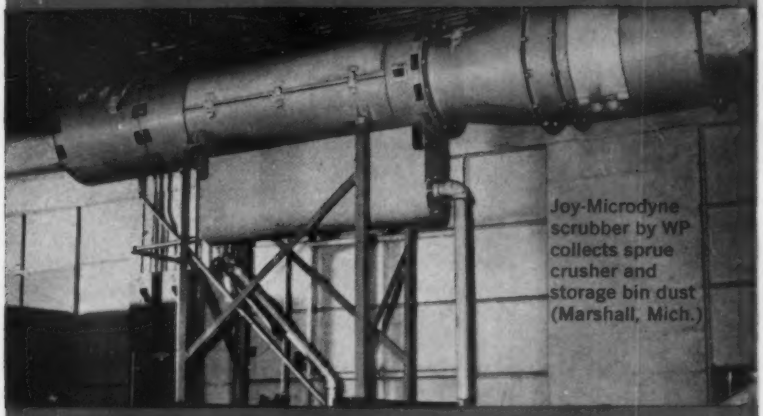
Eleven new regular-type bandsaw blades will be established with acceptance of a proposed amendment of Simplified Practice Recommendation R214-55 for Metal-Cutting Bandsaws (Hard Edge, Flexible Back).

The proposed amendment was requested by the Hack and Band Saw Manufacturers Association of America, and it has been submitted to the industry for consideration and general acceptance.

Copies of the proposed amendment are available from the Commodity Standards Div., U. S. Department of Commerce, Washington 25, D. C.

Texas Section Elects Officers

New officers elected recently by the San Antonio Section of Texas Chapter, American Foundrymen's Society, include the following: Chairman, Frank Page, Alamo Iron Works; co-chairman, Harold Fraunhofer, K. O. Steel Castings Inc.; secretary and treasurer, Ralph Thompson, K. O. Steel Castings Inc.



Joy-Microdyne scrubber by WP collects sprue crusher and storage bin dust (Marshall, Mich.)

Gray iron foundries in Michigan... and in Southern California... agree:

Dualaire Reverse Jet Filter by WP collects sand mold shake-out dust (Los Angeles, Calif.)

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also: HOLO-FLITE Processors
HI-TURBIANT Heaters
TURBULEX Calciners

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FOUNDRY DEVELOPMENTS

By EDWIN BREMER
Metallurgical Editor

Malleable Properties

STRENGTH of malleable iron—in both machined and unmachined specimens—is well maintained at low temperatures, it is indicated in a study by N. Tsutsumi, Waseda University, Tokyo, Japan. Results are given in the university's *Report of the Castings Research Laboratory*, December, 1960.

Tests show no distinct change in tensile and yield strengths between room temperature and −103° F and a gradual increase at temperature down to −148° F. Elongation declines while Brinell hardness increases with a decrease in temperature. Charpy impact strength drops gradually as temperature is reduced to −103° F and rapidly with further reduction.

Inoculation Factors

INVESTIGATION on "Factors Influencing the Inoculation of Cast Iron" by J. V. Dawson, as reported in the March issue of *BCIRA Journal*, led to the following conclusions on both flake and nodular graphite irons:

Normal commercial ferrosilicon is a powerful inoculant due to the presence of aluminum and calcium dissolved in it. Inoculants containing either aluminum or calcium separately are less effective than those in which both elements are present.

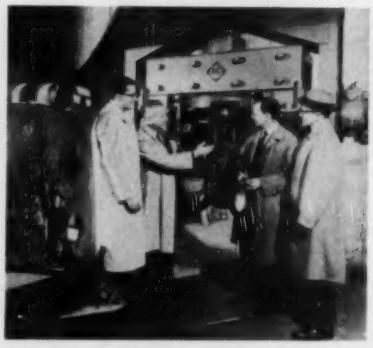
If the particle size of the ferrosilicon lies between 12 mesh and ½ x ¼ in., little variation in inoculation is likely to occur as a result of changes in the size grading of the ferrosilicon. Increasing the carbon equivalent of the melt reduces the effectiveness of inoculation by normal ferrosilicon.

With flake gray irons, graphite is a potent inoculant both by itself and when added with ferrosilicon. Care must be taken to avoid too much carbon pickup from solution of the graphite since reduction in strength will result. Inoculation of irons of above 3.9 CE can cause a reduction in mechanical strength.

In nodular irons, good inoculation is given by additions of a silicon-manganese-zirconium alloy, and fairly good inoculation is achieved by additions of calcium silicide giving equivalent silicon additions. Mechanical properties are influenced markedly by the carbon equivalent of the base iron, tensile strength decreasing and elongation increasing as the carbon equivalent increases.

High-strength Steel

RECENTLY Esco Corp., Portland, Oreg., was licensed by U. S. Steel Corp. to produce its T-1 steel in the form of castings. The steel is a high-strength, low-alloy (Mo-Cr-Ni-Cu-V-B) material, and according to the firm its addition to the diverse list of Esco's casting alloys will give design engineers a new tool for improving performance and operating economy of many types of industrial equipment. Quality of the T-1 steel castings will be checked often with the betatron x-ray shown in the accompanying illustration.



Spectrochemical Standards

TWO new types of spectrochemical standards have been developed and made available by the National Bureau of Standards, Washington 25. They include a set of eight white cast irons and a set of three naval brasses. The white cast irons in chill-cast form only are certified for carbon, phosphorus, sulfur, silicon, manganese, nickel, copper, chromium, molybdenum, and vanadium. The three naval brass standards are available in chill-cast and wrought forms. They are certified for copper, zinc, lead, and tin. Two are certified also for manganese, and one for nickel. The cast iron and naval brass standards may be purchased for $25 per sample from the Standard Samples Clerk of the bureau, and further information may be obtained from the same source.

Rust Preventives

CALCIUM and zinc molybdates equal or exceed the rust preventive characteristics of red lead and other inhibitors commonly used, according to recent research conducted at Battelle Memorial Institute for Climax Molybdenum Co. Division, American Metals Climax Inc.

B. G. Brand and H. O. Schoen of the research center point out that the molybdates have two other advantages over red lead, zinc chromate, and iron oxide in that they are nontoxic and white. The nontoxicity makes them acceptable in food processing machinery, food storage containers, water containers and transmission lines. The whiteness provides light-colored undercoats where essential.

Microradiography

X-RAY projection microradiography as a metal testing technique is evaluated in a research report recently released by the Office of Technical Services, U. S. Department of Commerce, Washington 25. Designated PB 171,381 it is entitled "Metallurgical Application of X-ray Projection Microradiography" by J. Vettraino and F. Seppi, and is available for $1.75. Aspects studied included preparation of the thin specimens, measurement of the resolution of the instrument, comparison with the optical metallograph, and conversion of the x-ray microscope to a more useful metallurgical instrument capable of recording diffraction data or performing spectrochemical analyses over microscopic areas.

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5 Strictest Quality Control—with over 100,000 tests per month from mines to shipment—makes sure you always get alloys of uniform size and analysis, with minimum fines, lot after lot.

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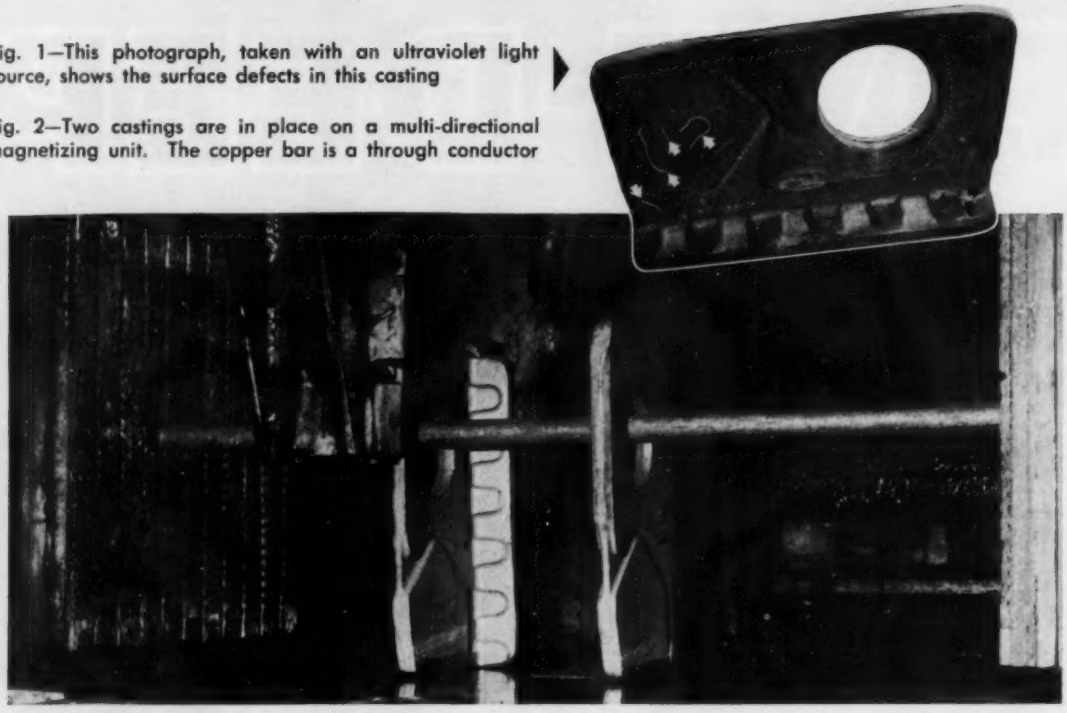
For More Information Circle 596, Page 39

Fig. 1—This photograph, taken with an ultraviolet light source, shows the surface defects in this casting

Fig. 2—Two castings are in place on a multi-directional magnetizing unit. The copper bar is a through conductor



Making Efficient Use of

Magnetic Particle Inspection

By PAUL E. EUBANKS
Chief Inspector
Steel Div., Ohio Steel Foundry Co.
Springfield, Ohio

● THE USE OF magnetic particle inspection in foundries such as Ohio Steel Foundry Co. has increased rapidly in the last ten years, and demand for it has grown similarly.

Until 1950 we did very little of this type of inspection—in fact, we had only one dry powder unit in operation, and it was used primarily to check pilot or sample castings. Demands of our customers compelled us, however, to go into full-time magnetic particle inspection in October, 1950.

We used the standard, portable units which provide half-wave, direct current for magnetizing purposes and use red powder to indicate discontinuities. The demands for this type of inspection continued to increase until it became necessary for us to look for a faster, better method of performing this work.

In our search for this improved method we considered these points important:

1. With the prod and dry powder method, a defect produces an indication only when it lies at some angle across the magnetic field, with maximum sensitivity when the defect is oriented at 90 degrees to the magnetic field. It follows that to insure location of defects in all directions in a given area, the area must be energized in at least two separate operations with prods rotated through 90 degrees.

2. Using the basic procedure just outlined, no two operators would cover a given casting in exactly the same manner. In fact, the same operator rarely would cover two like castings in the same manner.

3. There always is the possibility that an operator even may unintentionally miss checking a certain area. This hazard is particularly great with large castings simply because of the large amount of surface area to be covered.

4. Color contrast between casting and powder should be improved.

5. The dry powder indications build up relatively slowly, necessitating maintenance of magnetizing current for long periods of time. This delay results in a constant temptation for the operator to shorten magnetizing time.

Searching for an answer to some or all of these problems, we investigated the method of magnetic particle application called Magnaglo and a new method of magnetization which, for the moment, we will call "over-all magnetization."

In the beginning, Magnaglo was a liquid method in which the magnetic particles were coated with a fluorescent dye and suspended in kerosine or a similar liquid which acted as a carrier for the particles. A natural development was a powder that could be suspended in water, with an improvement in delineating the sought-for discontinuities.

By this method the part is mag-

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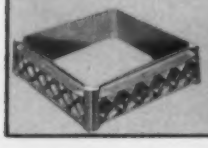

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IF IT'S A "POP-OFF"... IT'S HINES... IF IT'S HINES... IT'S THE BEST

For More Information Circle 597, Page 39

netized as with the dry powder, but the magnetic particles are applied by flooding the part with a hand hose or spray gun. As the particles flow over the casting they are attracted and held to a defect as in the dry powder method. Magnaglo particles are much finer than the dry powder particles, however, and are not normally visible under conventional light. When activated by ultraviolet light, the particles fluoresce with a yellowish-green color. Such indications, we feel, actually attract attention.

Fig. 3—Other types of discontinuities are shown here

The second part of the problem —that is, finding a way to magnetize a casting in all directions but still perform only one inspection— was worked on by the application laboratory of Magnaflux Corp., Chicago. Castings of various sizes and shapes with artificial defects were spotted in strategic locations, and the effectiveness of many magnetizing methods carefully studied. The final result of this work was the unit now in operation in our plant.

This unit produces what may be called multi-directional magnetization. With this method of magnetization, as many as three fields, each in different directions, can be induced in a part in a rotation sequence, and the inspection is performed after all the various magnetizations have been induced. A typical multiple setup is shown in Fig. 2.

The copper bar contacts the head and tail stocks, thereby acting as a through conductor, and the boom assembly makes contact on the edges of one of the castings. The procedure is to spray the first casting, energize the boom contacts and head and tail stocks, move the boom contacts to the second casting, spray, and energize the boom contacts and head and tail stocks.

The castings then are inspected in a dark booth under ultraviolet light. Obviously, more than two castings can be handled in this setup. Typical indications are shown in Fig. 1. This photograph was taken with ultraviolet light as the light source since, as noted before, the indications shown are not visible under conventional light. Other types of discontinuities are shown in Fig. 3 and 4. An over-all view of the unit is shown in Fig. 5.

We do not feel that this method is the panacea for all magnetic

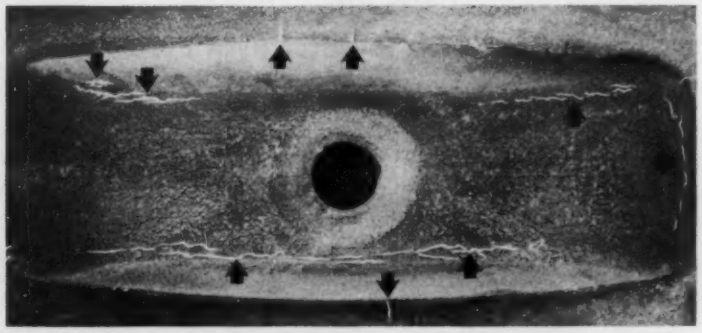
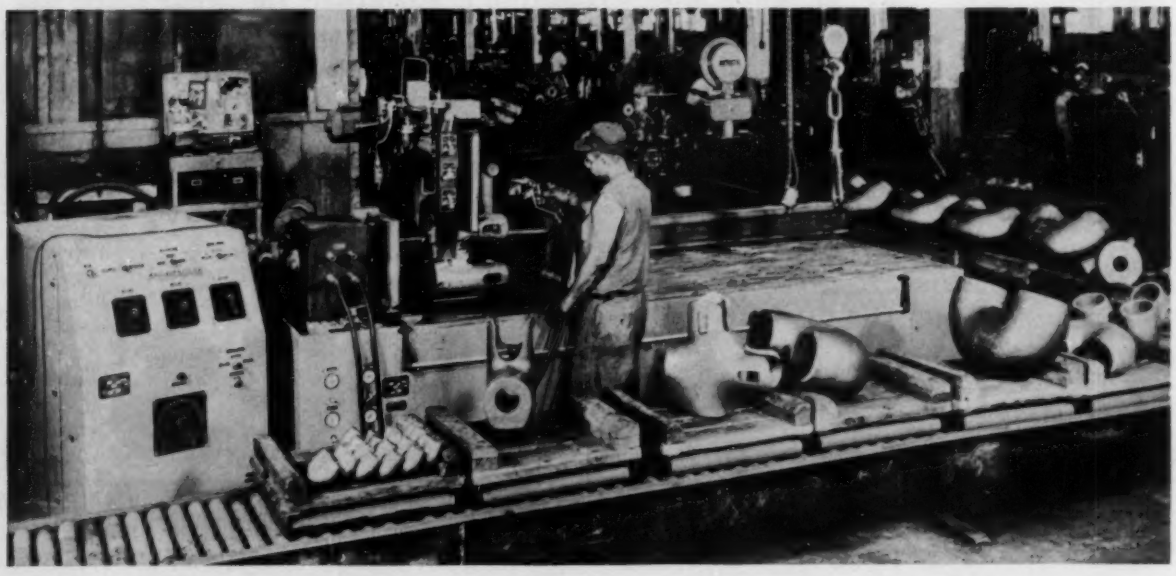


Fig. 4—These defects are not visible under ordinary light, but as can be seen here, they show up clearly under ultraviolet light

Fig. 5—This is an over-all view of the multi-directional magnetization unit. After castings are magnetized here, they're examined in a darkroom



Circle 598, Page 39→

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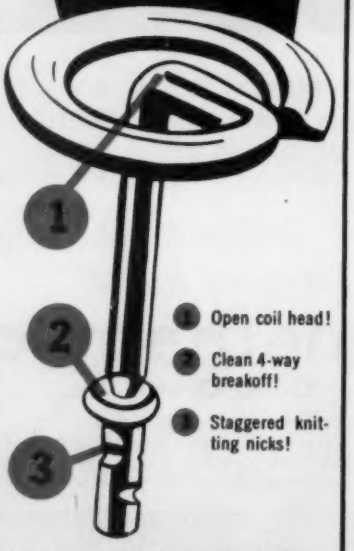

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For More Information Circle 599, Page 39

particle inspection problems since mechanical contrivances do develop ailments and human beings do commit errors. We can, however, hold both to a minimum by the use of proper safeguards. Our check list now reads as follows:

At the beginning of each trick:

1. Start agitation system by energizing pump motor.
2. After system has agitated for 30 minutes, fill centrifuge tube to the 100-cc mark, and allow to settle for 5 minutes. Check for correct bath strength and adjust if necessary.
3. Process sample part and inspect for indications. If indications of known defects are sharp and bright, proceed with production parts.
4. Record results of tests on daily record sheets.

Each Monday morning:

1. Remove the black light bulb and filter from the portable black light. Clean and reassemble.
2. Process a sample casting, using three-way magnetization. Check castings with the magnetic field indicator, noting the relative values of the leakage field. Demagnetize the casting using the contacts and again check the magnetic field indicator to determine whether or not the casting has been demagnetized properly. If the casting is not properly demagnetized, check the demagnetization circuits of the unit for trouble.
3. Record compliance with these checks on daily record sheets.

Every other morning the bypass hose is removed and any obstruction are blown out.

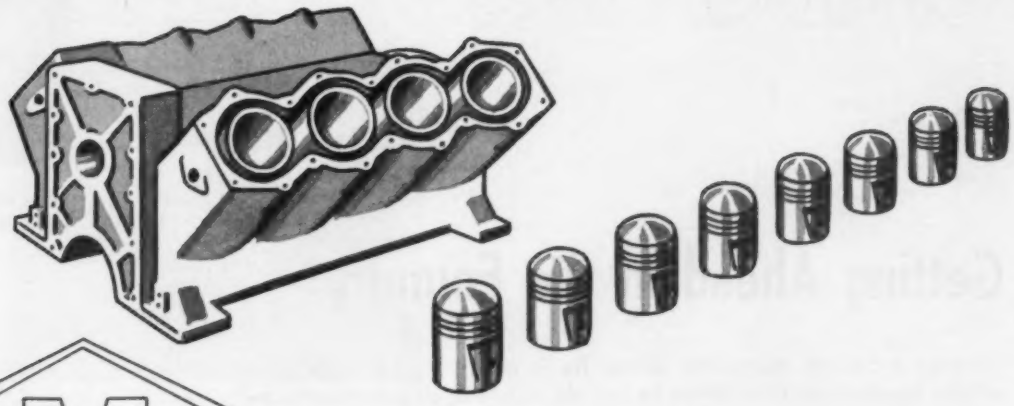
Limitations—It should not be assumed, however, that this method has no disadvantages compared to the dry powder and prod method. Here is a comparison:

1. The Magnaglo unit will not locate subsurface discontinuities as readily as prods and dry powder. Two points should be considered in relation to this factor: A. Subsurface defects generally are considered less detrimental than the same discontinuity open to the surface. B. Experience shows that even when the prods and dry powder are used, the number of subsurface defects detected in a full day of work is very small.
2. The material cost of dry powder versus Magnaglo paste is rather unimportant. We calculate that to inspect a ton of castings (with an average weight of approximately 25 lb) with dry powder costs 25 cents, whereas the same operation with Magnaglo costs 18 cents.
3. Most dry powder units are portable. The Magnaglo unit is not. For us, this factor is a minor disadvantage, since we rarely moved our dry powder units.
4. The Magnaglo method unquestionably is faster than prods and dry powder.
5. A Magnaglo indication stands out more clearly than a dry powder indication.
6. The Magnaglo unit provides a quick method of demagnetization. All that is required is to set up the casting in the same manner as for magnetization, set the demagnetization switch, and push the button. In a matter of seconds, the job is done. This feature is valuable since most foundries are getting more and more into aircraft work, which demands this demagnetization.
7. The frequency of arcing, which generally results in the formation of a small hard spot on the surface of the casting, is reduced greatly by use of the Magnaglo method.
8. We have better control of magnetizing operation with Magnaglo. Uniformity is lacking in covering castings with prods.

In spite of the advantages of any process, final results depend on the integrity of operators and inspectors. We have not yet found a way to prevent occasional careless work and casual attitudes, but we strive constantly toward that end.

"It was the only thing handy when she gave me her telephone number"

From pistons to engine blocks...



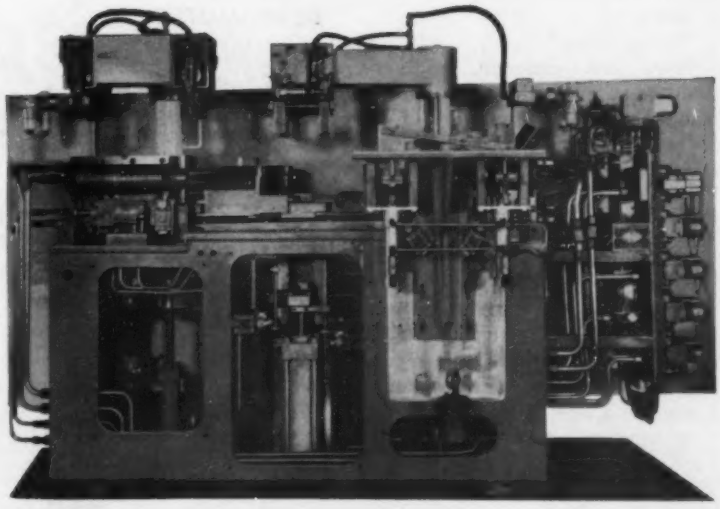
Automated Molding Equipment increases production, lowers costs

The designing and building of special automated molding equipment is an important part of the work at Permanent Mold Die Co. Typical of the equipment that PMD has developed for industry is this Automated Piston Molding Machine.

This machine incorporates the advantages of metal molds and cores, manual or automatic operation, and adaptability to various sizes of pistons. It has increased the rate of piston production almost 600%.

The automatic cycle on this particular machine includes insertion of dimension-control bands into the mold, assembly and disassembly of molds and cores, and transfer of completed pistons to customer's chute or belt conveyor. These PMD machines are designed to operate in groups of two, utilizing a single operator. The operator can pour at one machine during piston solidification at the other. These machines are also adaptable to automatic ladling. Most of the processes of this machine are hydraulically actuated and all the electric, hydraulic, and pneumatic functions conform to Joint Industry Conference Standards.

The machines developed and built by Permanent Mold Die Co., can produce small parts such as pistons, as well as large automotive aluminum castings. This equipment is developed to **your** specifications, to meet **your** particular needs.



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For More Information Circle 600, Page 39

By RALPH L. LEE, *President*
Lee Hobby Foundry, Birmingham, Mich.

Getting Ahead in the Foundry

"Everyone has to start from where he is now. It's the only place where anyone can show what he can do, really is, or promises to be"

● "DO YOU KNOW how the expression 'pin-money' came into use?" asked the chairman of the board of the Lee Hobby Foundry and the Lee family (Mrs. Lee).

Marking my place in FOUNDRY, I said, "I haven't the slightest idea."

"It says here," she went on, "that many, many years ago, pins cost $1 a dozen."

"Safety pins?"

"No, just common, ordinary, plain pins. They were so hard to come by and so necessary to the lady of the house that her kindly spouse budgeted her $1 a month to keep her pin inventory in shape. Hence, pin money. Get it?"

"Sporting of him, wasn't it?" said I, resuming my FOUNDRY.

I hardly knew what to do with this choice bit of information, but having a one-track mind I had some difficulty getting rid of the thought. I wondered how those early craftsmen went about making a pin by hand, and I shuddered at the thought of trying to do it. Never having been in a modern pin factory, I tried to imagine what sort of equipment and processes such a plant uses today.

Then I thought of the folks who have spent most of their lives in the pin business—and maybe their fathers before them. I almost could see the engineering or research department of one of the leading organizations, subdivided into units: Pin-head specialists, pointing specialists, metallurgists, masters of pin polishing, packaging experts, all sweating away to keep their firm from losing first place to competitors.

The thought then occurred to me

"I want to get ahead"

that within the tiny area fenced in by the outline of a pin was room for the expenditure of a lifetime in study and toil and the building of distinguished careers.

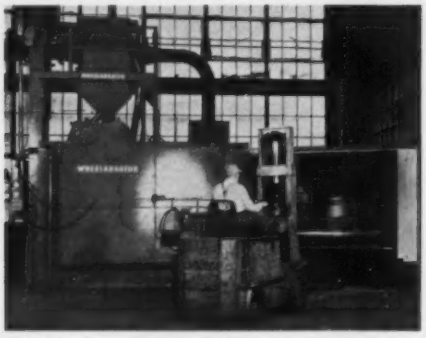
Foundry Careers — I doubt whether there are many persons, outside of salesmen of foundry supplies or equipment, who have visited as many foundries as I have. Looking back over these hundreds, I find it difficult to recall many in which I was not buttonholed by some individual who asked, "Doc, do you have a minute? Let's go in here so we can talk." Then after he had closed the door while casing the place for possible eavesdroppers, the conversation went something like this:

"Doc, you see, I'm one of these fellows who wants to get ahead. I can do the job I've got with one hand tied behind me. There's no future in it. Besides I have reason to believe that the boss is not particularly keen about me. Frankly, I think he's just a bit jealous of my schooling and ability. I've been on this job—let's see—it will be a year and two months next Tuesday. Doc! I know what I can do if I get the kind of an opportunity I want. You get around a lot, Doc; I thought you'd be willing to keep an eye open for me."

Although I don't have a list of the eager beavers who have waylaid me, and therefore can't speak on the basis of statistics, I'd be willing to bet that they were not included in 95 per cent of the promotions which have been made since in the foundries where they grunted and groaned on their jobs. The chances are that those boosted to posts of greater responsibility were so thoroughly absorbed in trying to

A demonstration of WHEELABRATOR'S

VITAL VALUES



Double-door Swing Table permits full-time cleaning operation. One load is being cleaned in the cabinet, while lift truck positions second load on alternate door.

Wheelabrator swing table **cleans** giant castings in one-sixth former time

Improved quality of cleaning and decreased cleaning time were immediate results of the replacement of an old airblast room with a 96" Wheelabrator Swing Table at a Michigan production plant for removing sand and annealing scale from castings weighing up to 10,000 lbs. each. The tremendous abrasive barrage from the two high-capacity Wheelabrator units combined with the ease of handling provided with the double work tables are reflected in greatly improved cleaning speed. In one case, pieces which formerly required several hours in the airblast room are now Wheelabrator cleaned in just 15 minutes. This capacity for work is just one of the vital values Wheelabrator equipment delivers to cost-conscious users. Write for complete information.

VITAL VALUES FOR INDUSTRY

WHEELABRATOR AIRLESS BLAST EQUIPMENT

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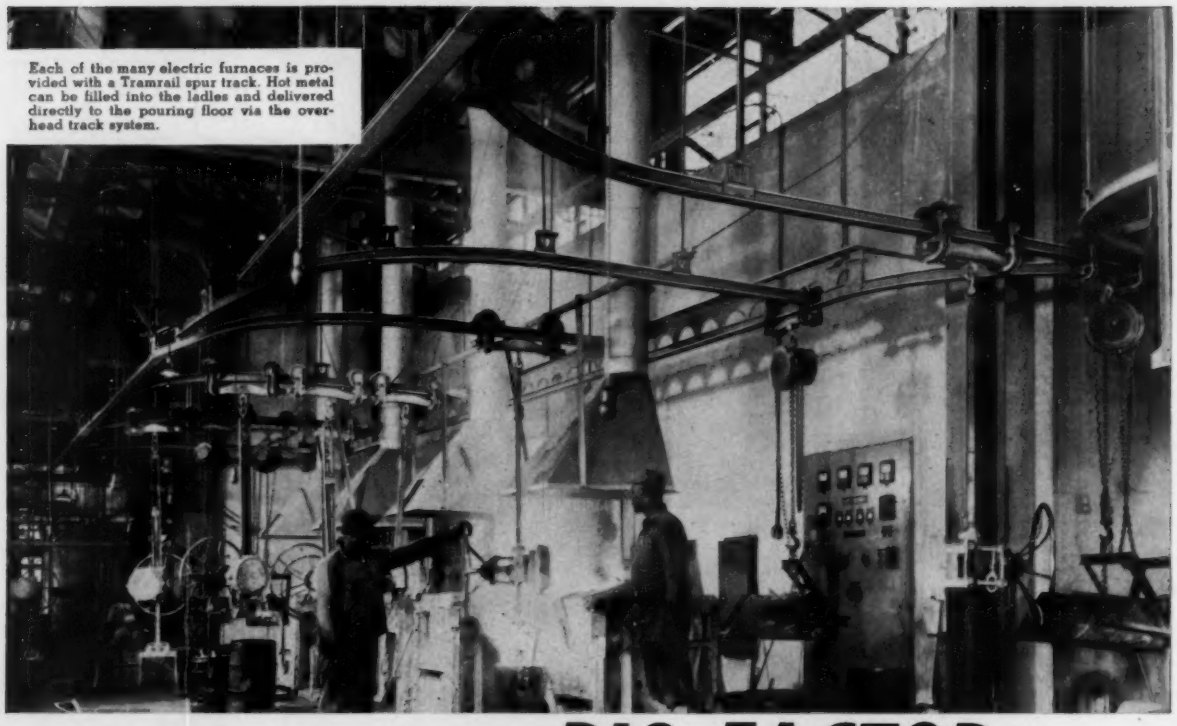
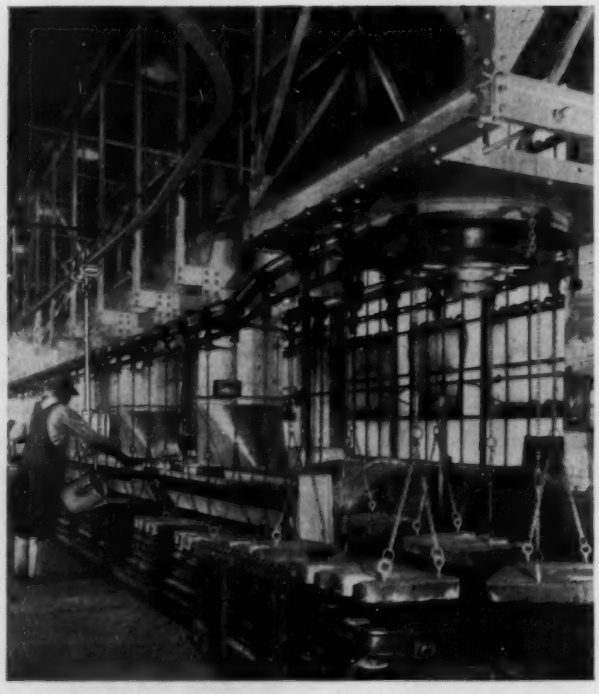


Each of the many electric furnaces is provided with a Tramrail spur track. Hot metal can be filled into the ladles and delivered directly to the pouring floor via the overhead track system.

CLEVELAND TRAMRAIL *BIG FACTOR* IN LOWERING FOUNDRY COSTS



Here an overhead Cleveland Tramrail system is coordinated with a continuous traveling mold conveyor. The worker stands on a moving belt and pours while on the move. The Tramrail carrier delivers the metal from the furnaces and supports the ladle during pouring.

Proves Itself in Brass Foundry of Large Valve Manufacturer

For more than 15 years one of the largest manufacturers of valves has made extensive use of Cleveland Tramrail equipment in its brass foundry, machine shop and other areas. Because of the satisfactory performance of the equipment, many new Cleveland Tramrail cranes were installed when its Number Two Plant was enlarged.

For the most part, the equipment is hand-propelled. Over the years, very little maintenance has been required and operation has been smooth and easy. The Tramrail materials handling units have contributed greatly in lowering production costs.

WRITE FOR FREE COPY of Engineering and Data Booklet No. 2008. Packed with valuable information. Profusely illustrated.

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 3850 E. 286 ST. • WICKLIFFE, OHIO

learn and do the jobs they were hired to do that they couldn't spare the time to think about or try to get the jobs they thought they deserved.

As the only employee of the Lee Hobby Foundry, I honestly can say that it is impossible for me to perform any of the many tasks which must be performed—from sweeping out through sand conditioning, molding, melting, pouring, shakeout, cleaning, and patternmaking—without uncovering some bungling on my part or an opportunity for future improvement. My list of needed improvements is a thing to behold and documentary evidence of my amateur status in the foundry industry.

May Heaven forbid that I use myself as an example, either good or bad, but I am convinced that the classification of amateur, honestly self-imposed, is a vitally important first step toward a professional rating in the eyes of others who count and toward promotion in terms of pay and post.

Start from Where You Are

I feel sure that one basic fact frequently is lost sight of by professional career builders—namely, that everyone has a start from where he is now.

Actually, it's the only place anyone can show what he can do, what he really is, or what he promises to be. No matter where his job seems to rank on the organization chart, it will provide sufficient room to demonstrate the qualities of dependability, ingenuity, and self-control required and sought for in positions of great responsibility and leadership.

The demand for these qualities always has been, is now, and will continue to be greater than the supply. In fact, it is so great and so urgent that to my way of thinking it is next to impossible for any one to lose himself in his job without being discovered, provided that he keeps it up long enough for the fact to percolate through. This time factor is all important, and impatience is often the problem.

Unless I miss my guess, this point of view can spark a lot of folks toward bigger, better, and happier accomplishment, for there seems to be room, even in a pin, for getting ahead.

A demonstration of WHEELABRATOR'S

VITAL VALUES

A minimum of three chemical analyses is performed on each heat of Wheelabrator Steel Shot to assure conformity to rigid chemical standards. Detailed laboratory analysis of microstructure further assures product uniformity.

Wheelabrator steel shot® consistent quality controls cleaning costs

To achieve a uniform finish in blast cleaning operations, at a relatively constant and predictable cost, and at uniform production rates, the abrasive used must be of uniform hardness and quality. Wheelabrator Steel Shot gives you this uniformity, from box to box and shipment to shipment. Its hardness, chemical analysis, microstructure and density are carefully maintained by close production controls and detailed laboratory analysis. Wheelabrator Steel Shot gives you the Vital Values of uniform cleaning results, uniformly fast cleaning speeds, reduced maintenance of your blast equipment, and uniformly low cleaning costs. Get the complete story in our Handbook of Blast Cleaning Abrasive Performance.

VITAL VALUES FOR INDUSTRY

WHEELABRATOR STEEL ABRASIVES

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MAY 7-11, 1962

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Almost 1000 feet of Red Carpet 12 feet wide will cover the main diagonal aisles of the Show

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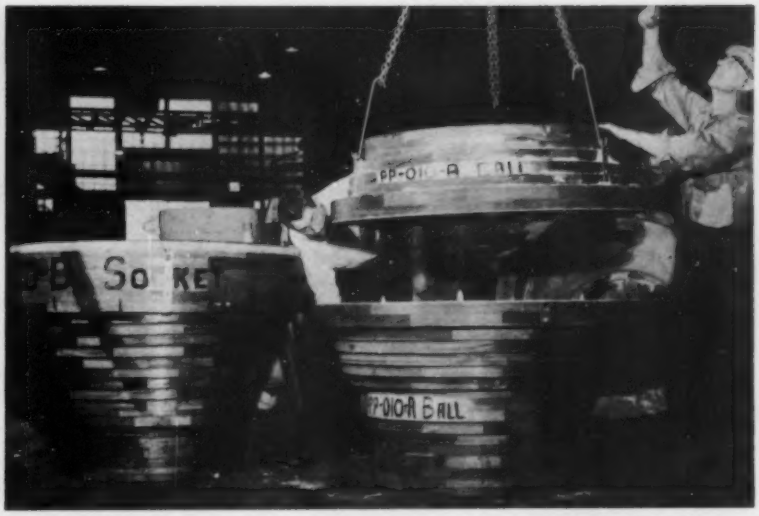
Core for a ball casting weighed 1120 lb, was hardened by CO_2



Corebox equipment for ball and for socket. Cores for ball and socket were lightened with a metal cylinder and a metal cone, respectively

Large Work Simplified with

CO_2 CORES

By WILLIAM M. FLINT
President
Olympic Steel Works
Seattle, Wash.

● USE OF the CO_2 process to produce cores for a large order of ball joint assemblies recently enabled Olympic Steel Works Inc., Seattle, to meet a tight delivery deadline and to cut costs at the same time.

A ball joint assembly generally consists of three basic steel castings—ball, socket, and gland—and is used to provide flexibility in pipe lines. This order was for hundreds of such units in various sizes. After machining and assembly, they weighed from 1850 to 5300 lb. Specifications required that both ball and socket be machined to within 0.005-in. clearance with a surface finish of 63 microinches on the ball and 125 microinches elsewhere.

Two factors led to the adoption of the CO_2 process to make these castings: 1. The need to meet a stepped-up delivery requirement. 2. The obvious desirability of cutting machining costs by producing castings to close dimensional accuracy. Not only were these goals achieved, but further benefits also were realized.

Once the decision to use the CO_2 process had been made, the problem was met and solved with the aid and technical assistance of Liquid Carbonic Div., General Dynamics Corp., which installed a bulk, low-pressure CO_2 storage tank.

Gas Piped to Stations—The gas was piped to 22 stations throughout the coreroom and molding areas. Quick disconnect fittings

Ball and socket castings with gates and risers, prior to blast cleaning

LET THE MAN FROM **AMERICAN** HANDLE YOUR **REFRACTORIES AND CRUCIBLE** NEEDS

He is specially trained and has the engineering background to use a whole family of American Refractories and Crucible products to help solve your molten metals handling problems. Let him prove to you how American products will . . . IMPROVE YOUR PRODUCTION — LOWER COSTS — LAST LONGER.

★ **STARRBIDE CRUCIBLES** . . . with carbon bonded "thin wall" construction gives you *more metal per heat; more heats per furnace;* and use *less fuel per pound of metal.*

★ **STARR BASEBLOCKS** . . . to fit any crucible and furnace are readily available from American.

★ **STARRLUM SUPER-REFRACTORY CEMENTS** . . . meet all refractory requirements under all plant conditions!

★ **STARR RAMMING & PATCHING MIXES** . . . Nine mullite or alumina-based mixes provide an answer to every need.

★ **SPECIAL POURING TROUGHS, SKIMMERS, SHAPES, ETC** . . . are another part of American's regular service to you.

★ **STARRBIDE SLAG HOLE BLOCKS** . . . reduce shut downs because they last longer!

★ **BONNETT STOPPER HEADS** . . . feature patented assembly details to improve your operations and reduce costs.

ENGINEERING LABORATORY SERVICES

Technical assistance in the use and installation of crucibles and all kinds of refractory materials is a new, improved service available through The Man From American. In the field and in our laboratory, engineers and production experts are prepared to work with you in every way to help improve your metals melting and pouring operations.

GOT A PROBLEM? TELL IT TO THE MAN FROM . . .

AMERICAN REFRACTORIES & CRUCIBLE CORPORATION

North Haven • Connecticut

were used on all of the outlets, and a uniform pressure of 35 psi was maintained at all discharge points with a regulator. Arrow point lances of ⅜-in. stainless steel tubing 48 in. long were used to gas the cores.

With this arrangement, cores weighing from 700 to 1100 lb were cured and ready to go into the molds after a gassing period of 7 to 20 minutes. Conventional curing methods would have required from 8 to 12 hours. Six-pound cores were gassed and ready for use in 30 seconds as compared with 2 hours conventionally.

As part of our corebox equipment, we employed a metal cylinder, centrally situated in the corebox, to save sand and lighten the core for the ball casting. This procedure resulted in a wall of sand which varied from a minimum of 3 in. to a maximum of about 8 in. A metal cone was used in the socket cores to achieve the same purpose.

Other Castings—On the basis of the experience gained during this job, which concerned only cores, we decided to use the CO_2 process to produce the castings required to make the bow and deck edge hawse pipe required in the construction of destroyers being made in the area.

Utilization of the CO_2 process eliminated the need for dry sand cores for the castings. Patterns for the intricate shapes and configurations involved are expensive, but we were able to save approximately one-third of the cost by simplifying pattern design and construction. Metal sections were determined easily and accurately, and the castings were produced faster, more accurately, and at less expense than previously would have been possible.

Added Benefits—The additional benefits mentioned earlier are important. On the basis of the jobs just described, they include the following: 1. Lower capital expense. 2. Less rodding of cores. 3. Greater dimensional accuracy and fewer defects because of the use of full coreboxes. 4. Less handling time. 5. Elimination of the need to backlog cores. 6. Elimination of core rejects due to faulty core plates. 7. Use of unskilled labor to produce difficult cores. 8. Increased life of corebox equipment. 9. Reduced

FOUNDRY PROVEN
Dietert-Detroit Moldability Controller attached to sand mill
CONTROL MOLD QUALITY automatically
WITH THE NEW
DIETERT DETROIT MOLDABILITY CONTROLLER

MOST IMPORTANT SAND CONTROL DEVELOPMENT IN YEARS

SIMPLICITY . . . 1. No parts in sand mixer. **2.** No complicated electronic circuits. **3.** No maintenance problems. **4.** No moisture juggling. **5.** No electronic technology needed to understand why unit works.

OPERATION . . . 1. Sand sample is taken from small opening in side of mill. **2.** Water is added from two valves while sand falls through a screen. **3.** Water is cut-off when sand is able to pass over screen. **4.** Discharged sand is of a selected and controlled moldability to give constant ramming qualities. **5.** The Dietert-Detroit Moldability Controller will adjust moisture to produce the proper molding sand while composition is changing under normal plant practice.

SAND CONTROL . . . 1. Sand composition is predicated upon quality of a master or production mold. **2.** Any shift in moisture level means the system sand is changing. **3.** Use laboratory sand tests to determine what change is taking place. Check strength, permeability, fineness and ingredient additions. **4.** Use master mold pattern to measure mold quality with 6 new mold quality tools.

RESULT . . . 1. A greatly improved sand control. **2.** A direct approach. **3.** A positive end-property control obtained with moldability and mold quality control. **4.** A more satisfied group of molders and a sand system that requires much less supervision. **5.** A more profitable operation.

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For More Information Circle 606, Page 39

WHIRLEX fans and dust collection equipment offer the maximum in efficiency regardless of the size or operating conditions. A wide variety of designs, metals and linings are available to you from WHIRLEX!

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Bag Collectors • Mechanical Collectors • Wet Collectors
Induced Draft Fans • Forced Draft Fans • Exhaust Fans
Self Supporting Stacks • Duct Work

danger of moisture pickup in cores.

For the castings concerned, we found the following core mixes capable of producing satisfactory results: New silica sand, 63 AFS fineness, 95 per cent; sodium silicate (a proprietary mix with 20 per cent invert sugar), 5 per cent.

The hawse pipe was molded with the following mixture: New silica sand, 63 AFS fineness, 91 per cent; fireclay, 2 per cent; wood flour, 1 per cent; pitch, 1 per cent; sodium silicate (same proprietary type), 5 per cent.

OTS Offers Two Bibliographies On Metallurgical Subjects

Two bibliographies, prepared by the Office of Technical Services of the Business and Defense Services Administration, list research reports, translations, and other technical documents covering two important metallurgical subjects:

"SB-452, High Temperature Metallurgy and Heat Resistant Alloys" is a 34-page listing of military and government agency research reports plus foreign research literature on high-temperature intermetallic compounds, alloys by powder metallurgy, brazing for high-temperature service, certain high-temperature metal coatings, etc.

"SB-454, Heat Treatment of Metals" lists reports of military and government agencies and foreign research literature from West Germany, France, the Soviet Union, and other nations dealing with heat treatment of high strength steels, titanium alloys, uranium-molybdenum alloys, zirconium alloys, and heat treatment research in general.

The bibliographies can be obtained for ten cents each from OTS, U. S. Department of Commerce, Washington 25, D. C.

Coke Plant Uses New Process

A coke plant employing a new process is being built by United States Smelting, Refining, & Mining Co. and Victor Chemical Div., Stauffer Chemical Co. at Midvale, Utah, near Salt Lake City. Completion is expected late this year.

The process, developed and tested by U. S. Smelting, is able to produce coke from western coals which previously were not suitable for coking purposes.

For More Information Circle 607, Page 39

YOU'LL DO A BETTER JOB

with H. V. ADAMS DESIGNED

HIGH EFFICIENCY FOUNDRY TOOLS

"UNIVERSAL FREE WHEELING"

FOUNDRY SAND RIDDLE

with the Double Eight Vibration

Because of its convenient size, light weight and good riddling capacity it long has been a favorite in the foundry. It also can be used for mixing core sand or for sifting sand directly into molds.

The mechanism is entirely enclosed protecting it from harmful dust and grit.

The main frame is cast in very strong tough aluminum.

It uses quick change ferruled sieves with 20 in. diameter sifting area. There are no loose wires to harm hands.

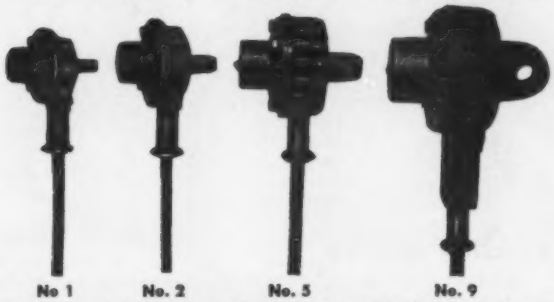
THE "ROTOPLANE" SPEED SIFTER

WILL GIVE YOU

- SPEED
- ECONOMY
- SAFETY
- LONGER LIFE
- GREATER SIFTING CAPACITY

Its sturdy one-piece frame and long shaft add to vibration effectiveness. The sealed-in mechanism assures protection of motor and bearings from exposure to dust and grit. This sealed in protection and "Rotoplane's" free-rotary action vastly increase bearing life. No exposed moving parts endanger the operator. Sieves have 20 inches diameter clear sifting area—are mounted in a smooth steel ferrule with no jagged edges to cause dangerous cuts and scratches.

"RED (Devil) ELECTRIC" VIBRATORS



No 1 No. 2 No. 5 No. 9

These hard hitting Adams designed Vibrators have served the foundries for over 30 years. They are provided with a 6 foot 3 wire authorized cable and 3 wire grounded connector which, when connected with our 3 wire grounded Red Electric Knee Switch, automatically grounds the vibrator protecting the worker from shock. The vibrators have passed the U. S. Government code inspection.

Other Foundry Products:

- No. 11 NOISELESS TYPE VIBRATOR
- A-20 ELECTRIC VIBRATOR
- RED ELECTRIC KNEE SWITCHES
- "ROTO" ADJUSTABLE BIN VIBRATOR
- 2 MIN. UNIVERSAL FINENESS TEST SIFTER.
- UNIVERSAL TRIPOD CARRIER

ORDER ALL SIFTERS AND VIBRATORS WITH GROUND WIRE!!

FOUNDRY SUPPLIES MANUFACTURING CO., NOT INC.

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For More Information Circle 608, Page 39

LITERATURE for Foundrymen

For More Information, Use Reader Service Card—Page 39

Induction Furnace

Bulletin 6113 features a 60-cycle, coreless induction furnace that can be operated on various single or three-phase voltages. Capacities of the furnaces range from 2000 to 15,000 lb of iron or 2000 to 11,000 lb of steel.—Detroit E'ectric Furnace, division of Kuhlman Electric Co., 11405 E. State Fair Ave., Detroit 34, Mich.

For More Details Circle No. 407—Page 39

Foundry Supplies

Four-page folder describes company's line of core and mold binders and other foundry products. — Archer-Daniels-Midland Co., Federal Foundry Supply Div., 2191 West 110th St., Cleveland 2, Ohio.

For More Details Circle No. 408—Page 39

Aluminum Alloys

Booklet describes high purity aluminum alloys C355, A356, and 357; compares their purity, ductility, strength, and castability; and outlines aging practice for alloy 357. —Kaiser Aluminum & Chemical Sales Inc., Dept. H-P 847, 300 Lakeside Dr., Oakland 12, Calif.

For More Details Circle No. 409—Page 39

Refractory Materials

Literature describes refractory materials for gun emplacement in cupolas, ladles, runners, etc., and also covers company's line of fire clays.—Lawrence Refractories Clay Co., Pedro, Ohio.

For More Details Circle No. 410—Page 39

Blast Cleaning

Bulletin 805 describes pushbutton-controlled LK and LM Rotoblast table-rooms. It gives complete dimensions and specifications of eight table rooms. Installations are illustrated.—Pangborn Corp., Hagerstown, Md.

For More Details Circle No. 411—Page 39

Air Aftercooler

Brochure explains operation of aftercooler for compressed air and provides engineering data.—Jas. A. Murphy & Co., Hamilton, Ohio.

For More Details Circle No. 412—Page 39

Scale Information

Information on scale error and how to eliminate it in a step-by-step procedure is contained in an eight-page booklet.—Howe Scale Co., Rutland, Vt.

For More Details Circle No. 413—Page 39

Management Consultation

"Helping Business Help Itself" is a 12-page booklet describing the services offered by management consultants to business and industry.—Profit Counselors Inc., 355 Lexington Ave., New York 17, N. Y.

For More Details Circle No. 414—Page 39

Crane Scales

Eight-page brochure describes scales for cranes or hoists which range in capacity from 500 to 100,000 lb.—Hydroway Scales Inc., P. O. Box 531, Oakridge Station, Royal Oak, Mich.

For More Details Circle No. 415—Page 39

Atmosphere Analyzer

Data describe an atmosphere analyzer, based on gas chromatography technique, for automatic analysis and control of atmospheres in metal treating furnaces.—Instrument Div., Perkin-Elmer Corp., Norwalk, Conn.

For More Details Circle No. 416—Page 39

Power Tools

Catalog of 68 pages contains complete information on over 100 of the company's power tools plus accessories. Illustrations and specifications are provided. — Skil Corp., 5033 Elston Ave., Chicago 30, Ill.

For More Details Circle No. 417—Page 39

Cutoff Wheels

Six-page bulletin describes and illustrates line of cutoff wheels for a variety of applications.—Dayton Safety Grinding Wheel Div., Simonds Worden White Co., 1101 Negley Place, Dayton 7, Ohio.

For More Details Circle No. 418—Page 39

Did You Miss These?

Here is a list of popular literature items offered in recent months:

ALUMINUM INGOT ("Aluminum Casting Alloy Ingot")—Aluminum Co. of America, Pittsburgh 19, Pa. Circle 402, Page 39.

MELTING-HOLDING FURNACE (Folder SEC-12)—Sunbeam Equipment Corp., Meadville, Pa. Circle 403, Page 39.

MAINTENANCE WELDING—Eutectic Welding Alloys Corp., Flushing 58, N. Y. Circle 404, Page 39.

STAINLESS STEELS—Wai Met Alloys Co., Dearborn 2, Mich. Circle 405, Page 39.

WETTING AGENT SYSTEMS — Aquadyne Corp., Clark, N. J. Circle 406, Page 39.

Fluid Flow Dryers

Folder 2909 describes how fluid flow dryers can be applied in drying, cooling, roasting, and other processes. A data sheet lists considerations of material characteristics and individual operating requirements for specific installations.—Link-Belt Co., Dept. PR, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 419—Page 39

Sand Coating Machine

Eight-page Bulletin SD150-61 describes and illustrates Model 150 sand coating machine, a self-contained unit which requires only air lines and electric power for installation.—National Acme Co., Shalco Div., 170 E. 131st St., Cleveland 8, Ohio.

For More Details Circle No. 420—Page 39

Silicone Release Agents

Eight-page booklet, S-13, is entitled "Silicone Mold Release Agents for the Metal Working Industries." Provided in the publication is a guide to help in selection of proper silicone release agents, a description of available materials, and suggested techniques for using silicone release agents.—Silicone Products Dept., General Electric, Waterford, N. Y.

For More Details Circle No. 421—Page 39

Coated Abrasive Products

"Catalog of National Standard Abrasive Belts, Rolls, Sheets, and Discs" lists standard coated abrasive products maintained in stock in company's warehouse.—Carborundum Co., Dept. BMD, P. O. Box 337, Niagara Falls, N. Y.

For More Details Circle No. 422—Page 39

Adjustable Speed Drives

Six-page Bulletin 2900 gives details such as ratings, speed ranges, controls, etc., on line of adjustable speed drives for applications in the ¾ to 2500-hp drive range. —Louis Allis Co., 427 E. Stewart St., Dept. P, Milwaukee, Wis.

For More Details Circle No. 423—Page 39

Hydraulic Presses

Bulletin 0943-B1 provides a description of design features, illustrations, and engineering data on F series 5-ton and 8-ton bench and floor model hydraulic presses for trimming, coining, straightening, or assembly.—Hannifin Co., division of Parker-Hannifin Corp., DesPlaines, Ill.

For More Details Circle No. 424—Page 39

Lift Truck Safety Kit

Lift truck safety kit contains a pocket-sized lift truck operator's guide, four

OHIO STOVE COMPANY FOUNDRY holds production costs down with SIMPLICITY equipment

At Portsmouth, Ohio, in the modern foundry of the Ohio Stove Co., the SIMPLICITY 4′ x 6′ shakeout and the 30″ x 17′ model VS-12 conveyor (shown here at work) are helping speed operations and reduce unit production costs. First, snap molds are floor dumped; then both castings and sand are scooped and loaded onto the SIMPLICITY shakeout. The castings are then carried on the SIMPLICITY conveyor to the waiting tote boxes. The many plants that are using SIMPLICITY shakeouts are indicative of their foundry-proved superiority. Get complete facts on SIMPLICITY shakeouts, feeders, and conveyors. Write us today.

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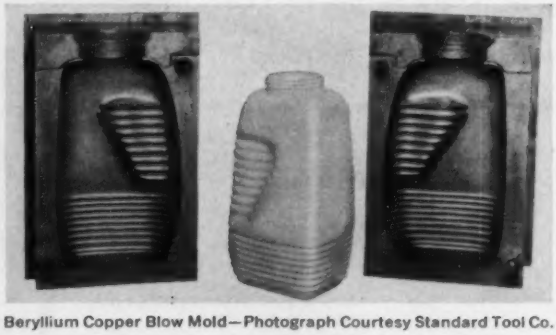
For More Information Circle 609, Page 39

BERYLCO Beryllium Copper Alloys Do the Extra Special Casting Jobs Without Extra Handling

High hardness, high strength, excellent thermal conductivity, good corrosion resistance, wear resistance and castability, as any foundryman knows, make an outstanding combination of performance properties for castings. They're all found in BERYLCO beryllium copper alloys, and they add up to easy handling, whether the job is a blow mold, casting die or any type of casting. In addition to the performance extras, fluidity is excellent, intricate detail is obtainable in "as cast" parts and pouring temperature is low. BERYLCO alloys have distinct advantages over ferrous and non-ferrous materials with similar properties.

Our foundry specialists can supply any assistance you may need. They'll be happy to send or bring you details on the use of beryllium copper.



Beryllium Copper Blow Mold—Photograph Courtesy Standard Tool Co.

BERYLCO®

THE BERYLLIUM CORPORATION

Reading, Pennsylvania

humorous safety cartoons for plant bulletin boards, and four route posters. The guide illustrates proper handling techniques for lifting, transporting, and stacking various types of loads.—**Towmotor Corp.**, 16100 Euclid Ave., Cleveland 12, Ohio.

For More Details Circle No. 425—Page 39

Plastic Refractories

Folder explains the features of plastic Ramtite refractories and their applications.—**Ramtite Co.**, 2563 W. 18th St., Chicago 8, Ill.

For More Details Circle No. 426—Page 39

Detachable Couplers

Twenty-page catalog contains facts and figures on detachable couplers for handling air, oil, or grease. Other products described include fittings, hose, three-way sleeve valves, and a new industrial blow gun with maximum-volume control.—**Foster Mfg. Co.**, Dept. IC-20, 2850 Gravois, St. Louis 18, Mo.

For More Details Circle No. 427—Page 39

Silicones

Booklet explains what silicones are and describes their uses. It includes photographs and graphs plus charts which cover the properties and features of silicone fluids, resins, rubber compounds, water repellents, antifoams, and emulsions.—**Silicones Div., Union Carbide Corp.**, 270 Park Ave., New York 17, N. Y.

For More Details Circle No. 428—Page 39

Aluminum Ingot

Folder gives details on the company's line of aluminum alloys offered in ingot form and describes its facilities for making the metal to rigid specifications.—**Briel Industries Inc.**, Industrial Park, Shelbyville, Ky.

For More Details Circle No. 429—Page 39

Bucket Elevators

Catalog BE-55 is an 84-page manual designed to simplify the selection and application of bucket elevator systems for handling bulk materials. It lists eight factors which must be considered in selection of the right bucket elevator for a given application.—**Webster Mfg. Inc.**, Tiffin, Ohio.

For More Details Circle No. 430—Page 39

Industrial Equipment

Bulletin 1279 is a 36-page catalog and price list for company's line of conveyors, bucket elevators, vibrating screens, crushers, feeders, belting, parts, and accessories. Examples of typical installations are included, with complete engineering data.—**Bonded Scale & Machine Co.**, 153 Bellevue Ave., Columbus 7, Ohio.

For More Details Circle No. 431—Page 39

Dust Collectors

Folder features 11 models of automatic dust collectors and their varied applications. Dimensions, drawings, and photographs are included.—**Automatic Collector Div., Torit Mfg. Co.**, 1131 Rankin St., St. Paul 16, Minn.

For More Details Circle No. 432—Page 39

Pneumatic Conveyors

Bulletin No. 530 features pneumatic conveyors for handling and transporting bulk materials. The 28-page booklet contains several case histories, as well as many photographs and diagrams.—**Draco Div., Fuller Co.**, Harvard Avenue & E. 116th Street, Cleveland 5, Ohio.

For More Details Circle No. 433—Page 39

Safety Clothing

"Safety Catalog," in a loose leaf binder, presents a range of safety gloves, clothing, and equipment for almost every use.—**Advance Glove Mfg. Co.**, 901 W. Lafayette Blvd., Detroit 26, Mich.

For More Details Circle No. 434—Page 39

Hoist Specifications

"HMA-400 Standard Specifications for Electric Chain Hoists" is available in booklet form.—**Hoist Manufacturers Association Inc.**, One Thomas Circle, Washington 5, D. C.

For More Details Circle No. 435—Page 39

Vibratory Mechanical Conveyor

Eight-page illustrated catalog provides complete data, descriptions, and specifications for light, medium, and heavy-tonnage vibratory mechanical conveyors.—**Syntron Co.**, 540 Lexington Ave., Homer City, Pa.

For More Details Circle No. 436—Page 39

Lift Trucks

Sixteen-page Catalog BU-660 covers the company's line of lift trucks in the 2000 to 10,000-lb capacity range. Photographs, other illustrations, power curves, and specifications are provided.—**Allis-Chalmers Mfg. Co., Engine-Material Handling Div.**, Milwaukee, Wis.

For More Details Circle No. 437—Page 39

SHAKE-OUT VIBRATORS
for all
foundry applications

Write for complete information and prices.

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PORTABLE OR PERMANENT
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For More Information Circle 611, Page 39

For EXPERT CONTROL.

IN THE CORE ROOM

WITH:

CHEM-REZ... Chemically reactive, high-speed, no-bake furans that let you strip heavy cores in minutes; intricate lacey cores in seconds.

LIN-O-SET... the air-setting binder that cuts fabricating time in half; baking time one third.

LINOIL... variety of oils to cover the complete working range of the modern foundry making oil-sand cores.

ADMIREZ... the line of resins offering a variety of specialized uses in making shell cores and oven-baked sand cores.

VELVA WASHES... refractory coatings of graphite, zircon and ceramics for velvet smooth casting surfaces.

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HILL SEACOAL ☐ PARTINGS ☐ GROUND PITCH BINDERS • Also

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WITH:

LIN-O-CEL... best stabilizer you can use to prevent tears, buckles, scabs and other expansion flaws.

GREEN BOND BENTONITE ... highest quality pure Western Bentonite imparts high bonding properties to new or reclaimed sand and allows maximum mold permeability.

CROWN HILL SEACOAL ... high VCM, high fixed carbon, lowest in sulphur and ash content... controlled screening... reliable quality bag after bag, car after car.

PARTINGS... powdered or liquid, to eliminate stickiness, improve casting finish and save repeated cleaning of patterns.

GROUND PITCH BINDERS ... lowest cost binders for dry sand molds.

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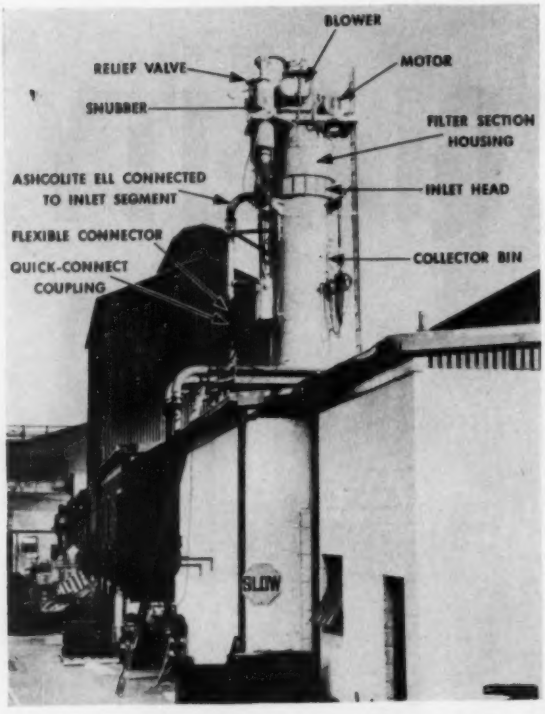
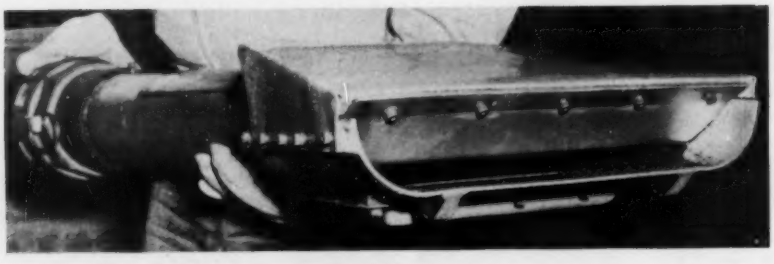
send charts: ☐ CORE OIL SELECTION ☐ CORE WASH SPECIFICATIONS

PNEUMATIC SAND UNLOADER

Cuts Operating Costs



Portable unloader is in position at one of the three stands at Electric Boat Div. Two stands are for sand, one for blast cleaning grit. Lettering on the illustration indicates components of the unloader



Close-up of the unloading tool, which is handled by one man. It pulls sand or grit through a flexible hose, up a run of permanent conveying pipe, and into the collector. This man is the only one required

View shows unloading hatches for both sand bins. Portable collector is attached to either and coupled to the corresponding pipeline

● A NEW sand conveyor-collector system in use at the Groton, Conn., plant of Electric Boat Div., General Dynamics, offers new conveniences and makes possible economies that help to offset the rising costs of operating a foundry, according to the company's engineers.

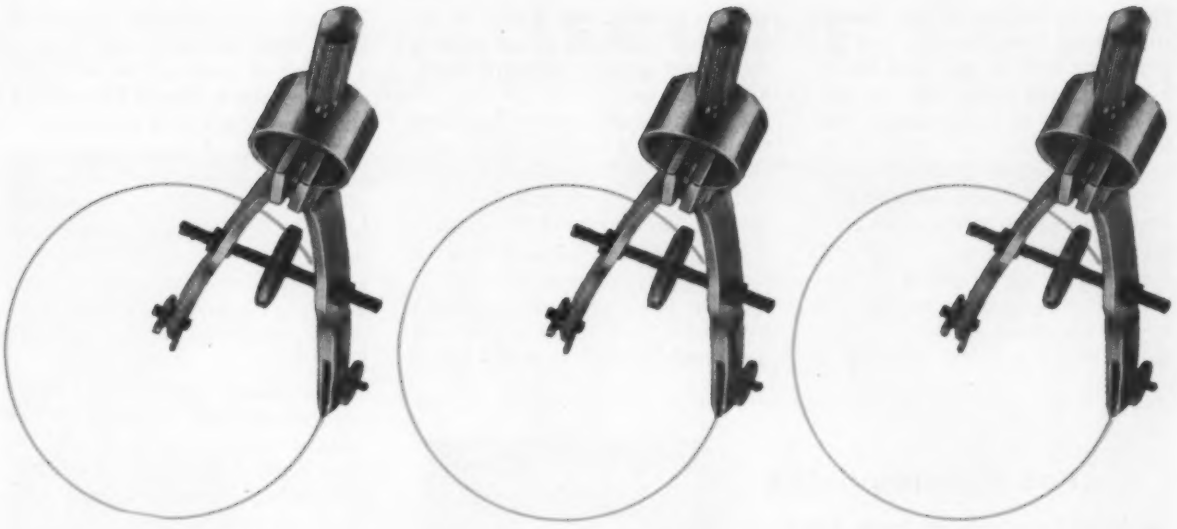
Because the system serves a dual purpose, it includes a portable sand collector. Primarily, the system is used to unload foundry sand from railroad boxcars to either of two bins for two types of sand used in the division's nonferrous foundry. The second function of the system is to unload blast cleaning grit from boxcars to still another storage bin, adjacent to the track.

The system consists of the portable collector, steel conveying pipe, flexible hose made of reinforced rubber, bronze quick-connect couplings, a stainless steel sand tool, and accessory equipment.

The collector is moved by crane from one storage bin to the other as required. It can be coupled to the proper unloading hatch and to a flexible conveying line in each of three locations.

The collector itself consists of a fabricated steel collecting bin with dump gate; a replaceable, extra-thick inlet segment; and an integral filter section in the upper housing. A blower, a snubber, and a vacuum breaker are mounted with interconnecting piping at the top and along the side of the filter housing.

When a boxcar is to be unloaded, the collector is mounted on and attached to the hatch above any of the three bins. It is connected with the conveying piping by quick-connect couplings. The sand tool is attached to flexible hose which, in turn, is connected to the conveying



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Your cleaning room costs will go down, when you start using CINCINNATI (PD) WHEELS. Our grinding specialists are at your service, to work with you in finding the best grading for your stand, swing frame and portable grinders. Once you have the (PD) WHEELS that give you the lowest labor and wheel cost, you can keep those costs down, because each reorder wheel will act and grind exactly like the original wheel . . . thanks to Positive Duplication.

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GRINDING WHEELS

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For More Information Circle 613, Page 39

piping. At start-up of the blower, air rushing into the sand tool entrains the sand or grit and carries it through the piping into the collector, where it is discharged into the inlet segment in a cyclone effect. Sand or grit drops down into the collecting bin and discharges by way of the dump gate into the storage bin below.

Conveying air is forced to pass up through the filter section into the blower, then through a reducing ell into a snubber, then into a vacuum breaker, and finally to atmosphere. A relief valve protects the blower against excessive build-up of vacuum.

Capacity of the system has been consistent since installation. It handles 9 tons of blasting grit, 6½ to 7 tons of one sand, and 8 to 8½ tons of the other sand per hour.

Manhours Reduced — Before the pneumatic system was installed, it required from 32 to 55 manhours to transfer the 50 to 60 tons of sand contained in one boxcar and 24 to 30 manhours to transfer a boxcar of grit. With the pneumatic system, a boxcar of sand can be unloaded and conveyed to bins in 8 manhours and blasting grit in 6 manhours.

Prior to use of the pneumatic system, a boxcar had to be tied up until six to eight men could be freed from other duties and detailed to the unloading operation. With the new system, the boxcar can be unloaded at any time, including at night, when traffic normally is light.

Low Maintenance — The blower has withstood six months of service without repairs of any sort. The filter media showed no wear or signs of breaking even after handling 40 boxcars of sand and grit. The flexible conveying hose, too, has offered exceptional service life.

The conveying pipe, quick-connect couplings, and the dust tool, however, have shown wear after handling the large quantities of sand and grit conveyed during the six-month period and have required repair during this time. At present, tests are being conducted with other materials and special linings to provide components with even greater resistance to erosion.

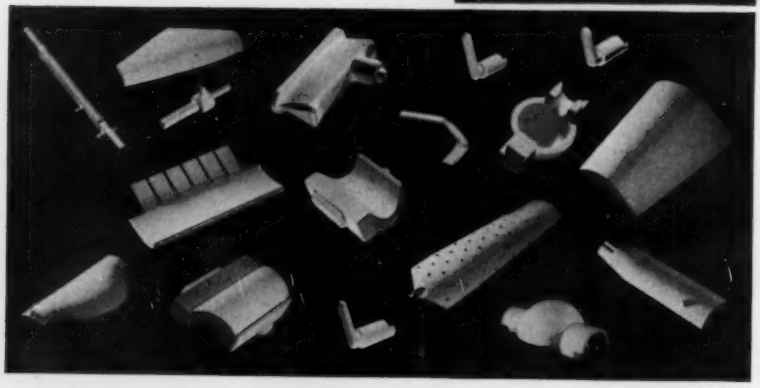
The pneumatic system in use at Electric Boat was designed and manufactured by Allen-Sherman-Hoff Co., Wynnewood, Pa., a division of A-S-H Industries, to specifications established by engineers at Electric Boat. Both organizations co-operated in conducting tests and in analyzing the suitability of system components and performance results.

Utah Chapter Elects Officers

Byron R. Mackay, owner, Lake Metals Co., Salt Lake City, Utah, has been elected chairman of Utah Chapter of AFS for 1961-62, succeeding Ernest S. Beckman. J. W. Nielsen, foundry superintendent, Columbia-Geneva Steel Div., U. S. Steel Corp., Provo, Utah, was named first vice chairman. Other officers include Jack N. Carter, works manager, American Foundry & Machine Co., Salt Lake City, second vice chairman; W. W. Brown, plant metallurgist, and Fred T. Hafenstein, foreman, both of Pacific States Cast Iron Pipe Co., Provo, secretary and treasurer, respectively.

For high-precision hollow castings from any alloy... in any configuration

Sherwood Ceramic Preformed Cores



The Sherwood Process assures close-tolerance coring accuracy, produces hollow sections without design compromise . . . cuts production costs

Sherwood ceramic preformed cores are custom designed to exacting tolerances to produce smooth, as-cast internal surfaces, specific wall thicknesses. Substantially volume stable and containing no residual gas, they may be used with vacuum-cast or air-cast alloys at temperatures in excess of 3000°F without fracture or distortion.

Sherwood cores overcome disadvantages of conventional coring techniques. Custom formulae for each application eliminate metal/core reactions and assure complete compatability with all methods of precision casting.

Sherwood cores are proving themselves in countless critical applications . . . everywhere.

Send for technical design data!

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only a **CLEAN-LINE**® furnace from hevi-duty brings you . . .

Only "Clean-Line" Heat Treat Furnaces from Hevi-Duty offer so many ways to speed production, cut maintenance and improve output. Consider these advantages:

1. Complete, automatic, "straight-through" operation from loading through quench.
2. Vestibule-housed transfer pusher head only under heat during 9-second transfer cycle. You get trouble-free operation.
3. Expansion seals for radiant tubes are at *cold* end. This system maintains tight atmosphere seal, lengthens tube life.
4. Externally located heat exchanger and pump for easy maintenance and high penetrating oil flow in the quench cycle.
5. Fan circulation for even distribution of heat *without* use of baffles.
6. Compact loading table — just 1½ baskets long — for savings in floor space.
7. Fuel-fired or electric models available.
8. Special options — automatic quench retractor, double-chamber design for two independent temperatures and two independent atmospheres, temperatures to 2100°F.

Suitable for carbonitriding, carburizing, bright hardening, annealing, normalizing and brazing, the standard "Clean-Line" furnace is used for heat treatment of metal to 1850°F. Complete systems are available . . . including heat treat and quench unit, gas generator, washer and tempering furnace.

Hevi-Duty's "Clean-Line" furnace is just one in a full range of products: heat treating furnaces, ferrous and nonferrous metal melting and holding furnaces, and industrial ovens — all available fuel-fired or electric. Get full details from your Hevi-Duty sales engineer or write to Hevi-Duty, Watertown, Wisconsin, for Bulletin D 100A.

HEVI-DUTY

Electric and Fuel-Fired Industrial Furnaces and Ovens

B P C

Hevi-Duty Electric Company, Watertown, Wis.

A Division of Basic Products Corporation

For More Information Circle 615, Page 39

Chicago Foundries Grant Wage Increases

CHICAGO—Thirty area foundries, members of the Chicago Foundrymen's Association, have signed a new two-year contract with Local 233 of the International Molders and Foundry Workers Union, AFL-CIO, which grants an 18-cent per hour increase over the term of the contract.

The previous two-year contract expired April 30 and an understanding was not arrived at on the new agreement until after a strike was called May 23 and continued four days. Idled were about 1000 molders and foundry workers in 24 Chicago, 1 Joliet, 2 Aurora and 3 Batavia, Ill., shops.

Under terms of the new contract, an 8-cent per hour increase was granted retroactive to May 15. This boosts the wage range from $2.19 per hour for laborers to $2.84 per hour for journeyman molders and coremakers. Another 10 cents will go into effect May 1, 1962. No fringe benefit changes were made in the contract.

Previously, 36 other Chicago and Fox River Valley foundries, employing 2500 union members, had granted the demand for a 7-cent per hour pay raise and an additional 0.5-cent an hour payment for the insurance program, retroactive to May 1.

Summer Lag Hits Eastern Shops

PHILADELPHIA—Seasonal lag in casting demand is in prospect. Major letdown should come early in July, with many shops (both consuming and producing plants) down for mass vacations for at least two weeks. Vacations and hot weather, however, will leave their mark on the casting business over the next two months.

June wound up on the downtrend, with gray iron jobbers operating three and four days a week. Some were actually pouring no more than two days a week. One leading gray iron producer estimates that the second quarter as a whole was no better for him than the first quarter, and that the first half averaged about 10 per cent below the same period last year.

A dearth of heavy work persists at the gray iron job shops—such as for auto dies, machine tools, heavy transmissions, and printing presses. Medium-sized work has been holding fairly well. This includes building contractors' supplies, conveying equipment and truck parts, and tobacco and food processing equipment components. At least one foundry reports good specifications for paper making machinery. Light casting work is spotty, although featured by some inventory buying.

Steel foundry operations have tapered, with the present average at around four days a week, compared with five a month or so ago. Also, backlogs range three to four weeks, which is low considering the processing involved. Lag is due principally to slow heavy industrial equipment buying.

In brass and bronze castings, the improvement noted a month ago has held up fairly well. This applies particularly to plumbing supplies, meters, and industrial valves. Propeller work and other shipbuilding needs, however, have proved disappointing. In general, red metal shop operations average four days a week, obviously not too good, but better than early in the quarter. Captive bronze and brass shops are perhaps doing a little better than the job shops, but in no case does there appear to be an overflow which would help the independent producers. Aluminum foundries are more active than other nonferrous plants. But it's touch and go with them to maintain a five-day week output.

Malleable shops have been moderately active of late.

GIFS REGIONAL MEETING: Michigan and northern Indiana management groups of the Gray Iron Founders' Society met in Detroit recently for a combined regional meeting. Left to right at the speaker's table are John E. McIntyre, Sibley Machine & Foundry, GIFS president; Richard W. Ayers, Bendix Corp., Lake Shore Div., chairman of the Michigan management group; Dr. Kenneth McFarland, educational consultant, General Motors Corp., guest speaker; and Donald H. Workman, executive vice president, Gray Iron Founders' Society

Steel Mill Orders Taper Off

PITTSBURGH — With the exception of a few nonferrous shops, foundries here are operating at depressed levels. Business was reasonably good in March and April, but the sales trend has been downward ever since.

A gray iron jobbing foundry reports that it's not working at all—not because it's on vacation but be-

HERE'S A QUICK CHANGE ARTIST FLEXIBLO®

Flexiblos Are Available In 8 Sizes For Cores Ranging From The Smallest To 500 Lbs.

THE WORLD'S MOST FLEXIBLE CORE BLOWER

Production, semi-production and jobbing core rooms all require speed plus flexibility in core production. Any time not actually devoted to the making of cores adds man hours . . . any machine that is not flexible increases costs. Any wasted time of manpower or machine hurts your competitive position. No wonder a "quick change artist" like B & P's Flexiblo has become a must in today's busy core room.

The Flexiblo's draw accommodates a wide range of boxes without machine adjustments . . . thus saving money by eliminating many non-productive minutes due to job changes. The quick-change blow plate allows the necessary changes to be made in seconds, thus cutting man-hour waste . . . many more core boxes are handled. An easily removable core box clamp provides even more flexibility.

Not only does Flexiblo accommodate the widest range of core boxes, permit the fastest change in the industry today, and accommodate any type of core box, but it also blows any core harder, faster, and at less cost than any other machine.

Flexiblos are B & P designed and engineered for maximum production and minimum maintenance. Your Beardsley & Piper representative is well qualified through training and experience to consult with you about cutting your core room costs. He will be happy to meet with you at your convenience —no obligation, of course.

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Div. of Pettibone Mulliken Corp.
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Inquire about new opportunities in the Value Analysis field to work with Designers to develop producible casting and forging designs for aircraft applications. Will be responsible for correct design and specifications.

Requires degree in metallurgy or engineering and 2-5 years experience in customer liaison and tool design relating to aircraft-quality sand, permanent mold, investment and plaster castings or forging design problems and manufacturing techniques.

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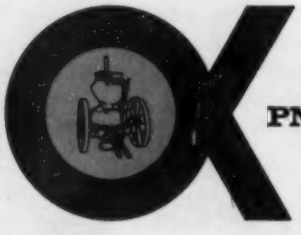
applies adhesive strength of sand-cement layer up to 10" thick in a continuous application!

Force sprays into every crack, crevice and corner for permanent strength in building, repairing or waterproofing concrete construction. Effective for sandblasting, when used without sand-cement mix. Completely dependable, both in operation and results. Has wide application in Steel Industries, Foundries, Refineries, Refractories, all Construction areas.



for details, write to
ALLENTOWN PNEUMATIC GUN COMPANY
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AREA CODE 215, HEmlock 3-4168

cause it has no orders. "We depend on a big manufacturer of steel mill equipment for most of our business," the owner explains. "When they're down, we're down too."

Since district steelmaking operations are at the highest rate in months—65 per cent of 1960 capacity—foundrymen are puzzled that the mills aren't buying more castings. Some say it's because they're trying to get by on minimum inventories. By one estimate, steelmakers used to stock about 80 per cent of their short-term requirements. Now they're carrying no more than 10 per cent of the castings they need.

Other foundries complain that steelmakers are doing a lot of work that they used to job out. "They're wrong," a gray iron founder complains. "If they keep it up, they're going to drive a lot of us out of business. They're gambling that the market will never get tight enough that they'll have to depend on us for part of their requirements."

A third theory advanced by some foundrymen is that casting sales are being hurt by the high cost of patterns. "If you've got only one or two parts of a kind to make, you'll think twice about ordering castings," a gray iron founder asserts. "Chances are that you could save a lot of money by going to a weldment."

Because business is so slow, prices are weak. Many foundries are so hungry for work that they're getting out of their normal fields and into heavier or lighter castings than they usually make. Says a medium-sized gray iron foundry: "We could throw most of the inquiries we get into the waste basket without even quoting on them. A lot of work seems to be going to lower cost producers outside the district."

For nonferrous foundries, the outlook is somewhat more cheerful. A bronze foundry that makes castings weighing as much as 3600 lb reports that it's running at about 80 per cent of capacity. Its owner attributes his success to three factors—specialization, fast service (seven to ten day delivery of rough castings), and business from customers all over the country. "We're not at the mercy of the steel industry's ups and downs," he explains.

Only the best distributors wear the VCA hard hat

The VCA line of ferroalloys is the top quality line, so naturally it's handled by the top quality distributors ...all carefully selected for their ability to give you complete and efficient service from strategically located warehouses. Make a note of your nearest VCA distributor from the list below and call him when you want the best—Vancoram ferroalloys.

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Producers of alloys, metals and chemicals

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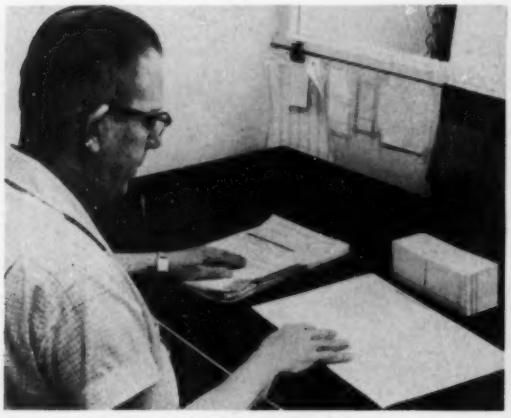

Fig. 1—The original order from a branch office is checked against a list printed from punched description cards on an IBM 402 accounting machine to insure that no mistake occurred when information was punched from the order into the cards

Fig. 2—Worksheet on daily progress of fittings is filled in at the plant. At the end of the day, it is forwarded to the data processing department

PUNCHED CARD SYSTEM

Helps Improve Customer Deliveries

By FRANK H. COUPLAND
Vice President and Works Manager
American Cast Iron Pipe Co.
Birmingham

● CUSTOMER deliveries have been speeded at American Cast Iron Pipe Co., Birmingham, through better production scheduling and more accurate inventories.

These improvements result mainly from the use of punched card accounting machines. With them, operational information can be obtained quickly to set and meet production schedules and expedite shipment of pipe, fittings, and steel castings and tubes to our customers.

The punched card equipment enables us to:

1. Determine tonnage for a given period and to stagger orders accordingly. In this way, we fill several orders at one time and replenish depleted stocks most economically.

2. On request from customers and our five district sales offices, we trace, in minutes, the status of an order or availability of an order or availability of any product we normally stock. This is done with reports updated daily.

3. Our automated system also helps us keep track of inventory. Inventory lists, mechanically prepared, are sent periodically to our district offices in Chicago, Dallas, Minneapolis, New York, and Kansas City, Mo. Thus, our salesmen can schedule delivery of orders almost on the spot by checking the lists, and, after consulting the home office, drawing from our stock.

Former Record Troubles — Our old manual system of scheduling production and maintaining inventories was a constant headache because records were rarely up to date, despite regular posting.

Production was scheduled on an item every few days, resulting in frequent setup time delays. And because we never were quite sure what was in production or in stock, we often found ourselves making fittings that were not needed. Some items, like 30 in. and larger fittings, could not be kept in inventory because of their bulk and usually were scrapped at the end of the year.

Since manually-maintained rec-

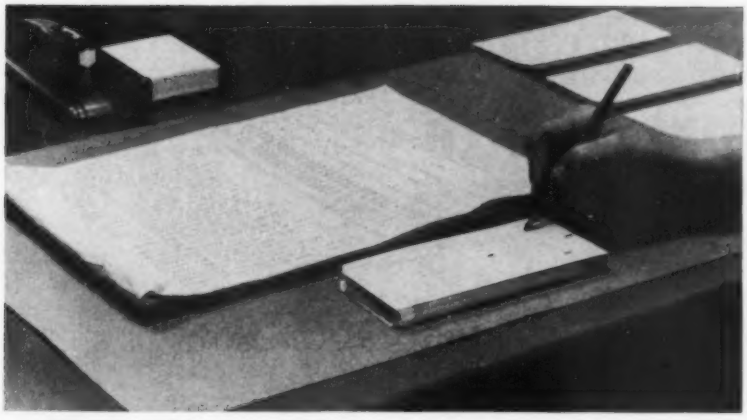

Fig. 3—On receipt of the worksheet, clerk pulls prepunched production control cards from file and marks them for activity and quantity. Special pencil marks are "read" later by an IBM 514 reproducing punch machine which is equipped with a mark-sensing device

ords gave no indication of how far along the production line a specific order had gone, we spent considerable time running down orders in the shop. The same situation existed for inventory records.

The New System—The present scheduling system works this way: A salesman takes an order, which is typed at the branch office and mailed to Birmingham.

On receipt, the order is checked by the sales engineer to verify that it meets specifications. Then, 18 duplicate copies are made and distributed to all output departments, including the loading dock, sales, foundry, machine shop, and pipe shop, among others. The foundry receives two sets. One is filed and another is used in determining which of four output centers will make the item.

At 8:30 the next morning, the production control manager and designated personnel from the machine shop, foundry, pipe shop, and shipping and sales departments gather for their daily promise meeting. They review the orders and go over the updated stock report to see what can be shipped from inventory. The group decides on a shipment promise date for each other.

The production control manager, compiles a list of items that can be shipped from stock and sends it to the shipping department. He sends the orders to the data processing department. There, an operator key punches into a blank card the customer's name, destination, promise date, sales order number, branch office number, and availability of the item for shipment.

These cards, called promise cards, are filed. On Wednesdays, they are merged with old promise cards and two lists are printed on the IBM 402 accounting machine.

The first list contains all of the orders to be filled. Copies are sent to the foundry, machine and pipe shops, and to the traffic, shipping, and sales departments. The cards then are sorted by branch office and a list of each branch's orders is prepared. The cards are returned to the file.

The orders are sent to the tub file section of the data processing department where a clerk pulls a prepunched description order card for each ordered item. If an item has never before been made at our plant, a card is punched and a supply of cards made up for future use. The description order card is prepunched with pattern number, part description, cost classification code, and unit weight. A clerk then key punches the date of the order, production center, order number, promise date, surface treatment code, and quantity. The card is verified.

The deck of cards is fed into the accounting machine, which prints a list of the items for checking against the orders to see that the description fits. The cards then are sorted into five decks—fittings, machined pipe, bolts, gaskets, and standard pipe—because each item is produced in a different department, except gaskets which are subcontracted.

Start Production — Work sheets

Fig. 4—Fittings report is run on an IBM 402 accounting machine

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for prompt and efficient service on

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Regardless of price, money cannot buy better bonding clays than those produced by Eastern. No one clay can bond every molding sand or meet the needs of every foundry. Eastern Clay Products produce *many* types of clays—to meet every specific need. Your inquiries are invited.

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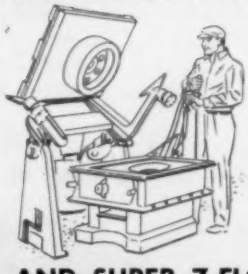

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are prepared on the accounting machine for items to be produced and are distributed to production centers. Most of these sheets are used in charting progress on a weekly basis. But fittings, because of their complexity, require daily work sheets for keeping track of the items by each shift.

Seven copies of a fitting work sheet are assigned to each of ACIPCO's four foundries. At each foundry, copies are routed to the pattern shop, core room, cleaning room (two), machine shop, foundry superintendent, and foundry scheduling office. At each station, notations are made on the sheet as to the work performed.

At the end of the day, the sheet, which is a step-by-step report of the progress made during the shift, is returned to the data processing department. Meanwhile, production control cards are punched in two runs on an IBM 514 reproducing punch and then filed for later use.

On receipt of the fittings work sheet, a clerk transcribes the information from the work sheet to the production cards, marking the activity code and quantity with a special pencil. These cards are used to prepare the next day's production control cards. This is done on the reproducing punch equipped with a mark-sensing unit which "reads" the pencil marks and punches the activity code and quantity into the cards.

The new production control cards are put through the accounting machine to print the daily core list and cast list for each department. The following day's work sheet is produced by combining the description order cards with the production control cards and running them through the accounting machine.

Each week the production control cards, showing what is on the production line and how far the item has gone toward completion, and other cards reproduced from the description order cards are used to update inventory and the order file, and to compile work load reports and work sheets.

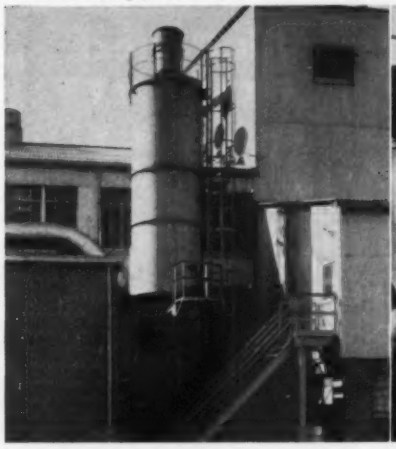
Thus from a comparatively simple punched card installation, we create the means to improve production schedules and provide better customer deliveries.

MULTI-WASH COLLECTORS OFFER THESE ADVANTAGES:

■ **HIGH EFFICIENCY** (up to 99.9%) for the removal of dust and fumes from hooded work stations is provided by **Schneible Multi-wash Collectors.** Waste flows continuously to a central dewatering tank where settling process clarifies water for return to scrubber for reuse. There are no moving parts, no spray nozzles to clog.

■ **CLEAN DUST-FREE OPERATION** of mold parting stations with complete control of air is provided with standard **UNI-FLO HOOD.** Adjustable louvers allow for efficient air distribution and compensation for unusual air currents. Workmen are not subject to drafts or dust and fume spillover.

■ **FLEXIBILITY AND ADAPTABILITY** is a feature of all **Schneible UNI-FLO SHAKEOUT HOODS.** They may be used at hand operated, low-volume stations or high production lines where molds are handled by crane, monorail or pusher. One, two or three sides may be open as required.

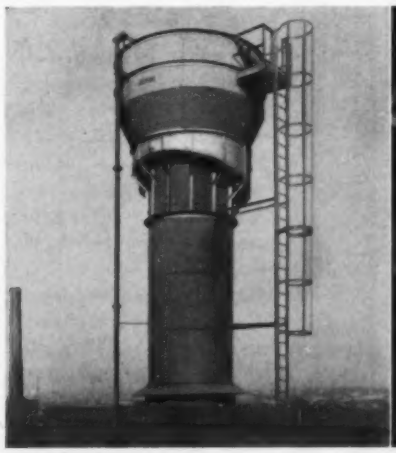


'SW' CUPOLA COLLECTOR SYSTEM HAS PROVEN BENEFITS YOU NEED!

■ **ELIMINATE COSTLY CLEANING AND REPAIRING** of roof and sash due to acid action of fly ash and fumes. **'SW' CUPOLA COLLECTOR** with patented non-clogging distribution head supplies heavy water curtain to stop fly ash and fume emissions. No fans, motors, spray nozzles or moving parts to maintain.

■ **SAVE MANPOWER** with automatic slag quench equipment. Slag is sluiced to a central disposal tank for easy removal. There is no secondary pollution problem in handling. Waste is removed as sludge to dumping facility after settling process is completed. Clarified water is pumped back for reuse.

■ **AUTOMATIC WASTE DISPOSAL** of fly ash and slag from central dewatering tank. Choice of method of removal is available. Standard tank designs permit use of tote boxes or clamshell to truck, depending on size of operation. Constant water flow assures continuous movement of waste from all areas.



AIR POLLUTION
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CONTROL

Refer to Sweet's Plant Engineering File No. 1e 5c

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Behind Magcobar's high performing foundry bentonites are engineers, dealers, and sales personnel who are eminently qualified to help you use Magcobar's complete foundry service to improve your castings production. Here are three of the personnel of the Magcobar Research and Development Center at Arlington Heights, Illinois.

Gerry Morrical, Manager, had five years experience in foundry production prior to joining Magcobar in 1955. Born in Walkerton, Indiana, and an All-America footballer at the University of Indiana, Gerry keeps one eye on industry trends and problems and the other on Magcobar activities, as he tailors Magcobar service for maximum benefits to customers.

Art Zrimsek, Sand Engineer, came to Magcobar five years ago with experience at several midwest foundries. He has a broad knowledge of foundry procedures and bentonite requirements. Born in Milwaukee, he holds B.S. and M.S. degrees in Metallurgy from the University of Wisconsin.

George Vingas, Foundry Research Engineer, has served as a Sand Control Engineer and as a Research Director with firms in the United States and Canada. His education and experience make him particularly qualified to conduct research in sand problems. Born in Alexandria, Egypt, he graduated from Farouk University at Alexandria.

These men are typical of the representatives who go to work for you when you buy bentonites from Magcobar.

Magnet Cove Barium Corporation
P. O. Box 355, Arlington Heights, Illinois
P. O. Box 6504, Houston, Texas

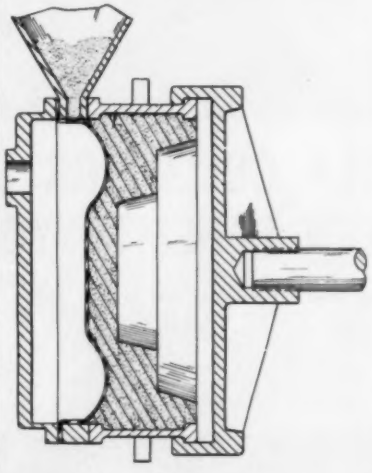
For More Information Circle 621, Page 39

PATENTS of INTEREST

Molding Machine

Unit for making molds by a combined blow-squeeze process includes a diaphragm and retainer, sand hopper, and flask handling ram which also carries the pattern. The sand hopper is mounted above, and is attached to the diaphragm retainer so that a long narrow slot opening is provided between the two.

The ram is arranged with lugs



to hold a foundry flask in the vertical position. In operation, a flask is attached to the ram, which is energized and forces the flask against the diaphragm retainer. Sand is blown from the hopper into the opening between retainer and flask. Pressure is admitted on one side of the diaphragm, squeezing the sand tightly against the pattern. *Patent No. 2,973,562 granted to L. F. Miller and assigned to Osborn Mfg. Co.*

Hollow Shell Cores

Apparatus for making hollow shell cores includes a support member movable between horizontal and vertical positions. This member carries a heated corebox, a sand-resin blowing device for blowing the sand mix into the corebox cavity when it is in the horizontal position, and a nozzle supplying hot gas as well as means for inserting it within the corebox cavity after the corebox has

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TYPE 592T

Type 592T, standard ladle recommended for automated production, is simple, safe, strong and dependable.

This ladle with Industrial Universal Bail eliminates gear bind and drag — frees the Foundryman forever from all heat distortion troubles.

Bail connection needs no lubrication or adjustments. Trunnion bearings have perfect freedom of movement within carefully determined limits. Result: A ladle with longer, more profitable life, immeasurably greater ease of operation than is assured in any other equipment.

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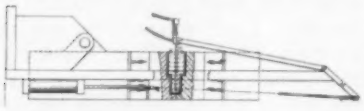
For More Information Circle 622, Page 39

been moved into the vertical position.

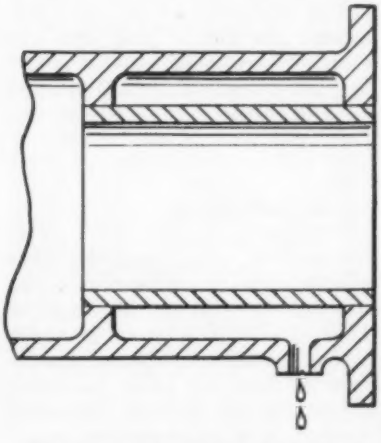
The corebox is split vertically so that it can be opened for removal of the core. In operation the blow chamber containing the sand mix is moved under the heated corebox whose opening is down, and sand is blown into the cavity. In a few



seconds a layer of sand ¼ in. thick is built up. Blowing is stopped, the corebox swung to the vertical position and the nozzle supplying heated air is inserted. Curing takes about 30 seconds. The corebox is opened and the core then is removed. *Patent No. 2,976,589 granted to W. S. Hackett and M. L. Bartsch, and assigned to General Motors Corp.*

Diecasting Blocks

In production of aluminum automotive cylinder blocks with cast iron insert liners, the chemically cleaned liner is placed in a diecasting machine and surrounded by a zinc alloy shroud. This shroud conforms in dimension and shape to the desired water jacket or coolant passage between the liner and the exterior aluminum shell of the completed block.



The liner and its shroud are placed in another diecasting machine and surrounded by an aluminum shell of the desired thickness. The shell contains a suitable opening for removal of the zinc. The completed piece then is heated to a temperature sufficient to melt the zinc shroud, but not the aluminum shell. The zinc is poured out through the opening,

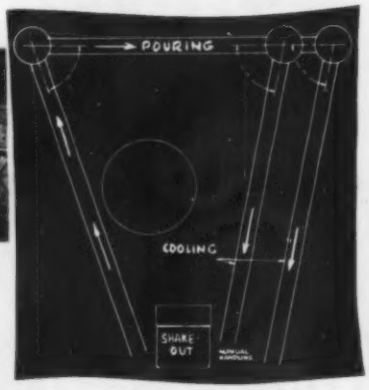
4,000 LB. MOLDS MOVE EASILY AND FREELY —

Large, palletized molds ride on NOMAD Heavy Duty Track (¾" x 3" special analysis steel rails).

Newly-installed at International Harvester's Milwaukee Works, this NOMAD Conveyor System gives great flexibility— features easy handling of molds of odd shapes and sizes, maintains a high production rate, and reduces manpower, too!

While turntables can be set at any degree, usually 90°, a key point of interest in this installation is the use of specially-indexed turntables routing molds at angles of 71° and 79° respectively.

Note the fabricated pallets which accommodate many mold sizes.



Basic NOMAD EQUIPMENT is shown here adapted to a specific installation. If you need a low-maintenance, "easy-to-handle" unit for your foundry *Write Today*

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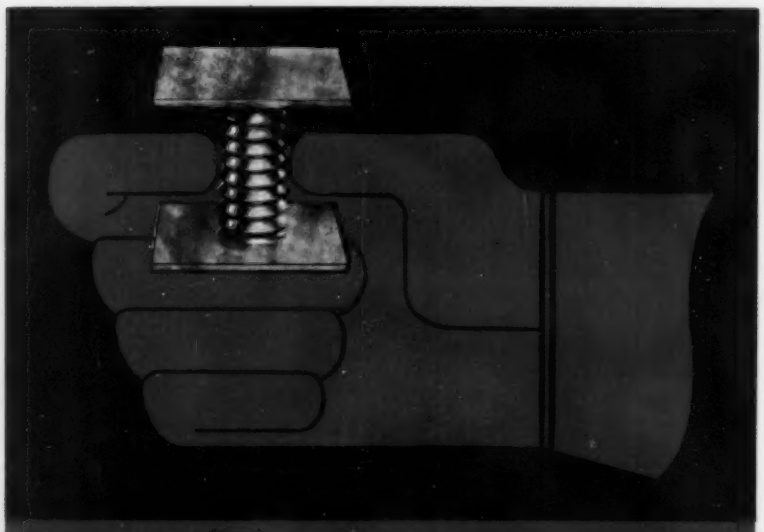

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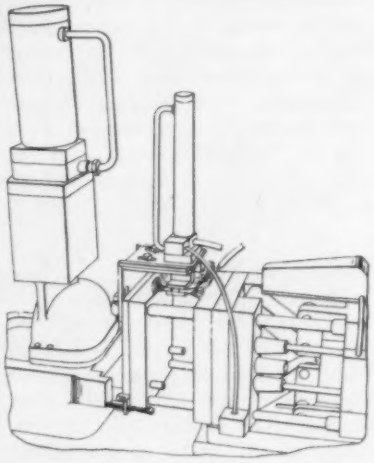
leaving the coolant passage between cast iron liner and aluminum shell. *Patent No. 2,978,764 granted to J. V. Hrabovsky and assigned to Ford Motor Co.*

Diecasting Machine

A device for keeping die faces clean, as well as for lubricating the faces and ejector pins, consists of two wire brushes mounted back to back on a brush holder. The latter is attached to an air-operated piston which moves the brush holder and brushes up and down. Motion



is controlled by switches and electrically operated valves. Brushes are shaped to brush the faces of the dies as well as to pass between and around the ejector pins and any cores which may be required in the dies. *Patent No. 2,974,379 granted to A. R. Mills and assigned to Die Casting Machine Tools Ltd.*

Grain Refinement

Refinement of grain size in magnesium-base alloys containing aluminum can be accomplished by treating the melt in the range of 1200 to 1700° F with an inorganic carbon-nitrogen compound. Latter may be from the group consisting of cyanides, cyanates, cyanamides, ferrocyanides, ferricyanides and thiocyanates. The proportion of the compound added has a carbon content weight equivalent equal to 0.01 to 1 per cent of the melt weight.

The carbon-nitrogen compound may be mixed with inert inorganic chlorides, fluorides, carbonates and oxides. *Patent No. 2,976,143 granted to L. Sturkey and V. B. Kurfman and assigned to Dow Chemical Co.*

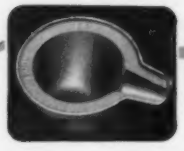
Acme

NON-FERROUS

MELTING POTS

•

INGOT MOLDS



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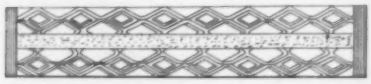
For More Information Circle 625, Page 39

Chilling Cast Iron

Procedure for providing a chilled or white structure portion in an iron casting employs a piece of nonmetallic tape coated with a thin layer of tellurium powder which is placed in any desired position in the mold cavity prior to pouring the molten metal. In the case of railroad brake shoes reinforced with strips of expanded sheet steel, the tellurium-



coated strip may be located on the strip nearest the working face of the shoe. In shoes without such reinforcement the tellurium-bearing strip is held in place with chaplets. The chill strip is cellulose acetate covered with finely divided tellurium in a lacquer binder, containing 30 milligrams per square inch. *Patent No. 2,979,793 granted to R. L. Wilson, F. B. Herlihy and T. J. Wood and assigned to American Brake Shoe Co.*

Core Sand Binder

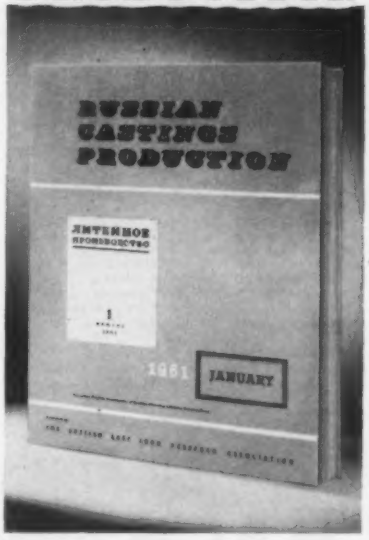
Addition of an organosilicon compound to oil-sand core mixtures is said to result in greater strength, higher surface hardness with less core oil, and a decreased tendency to absorb moisture and stick in coreboxes. The organosilicon compound is identified as the partial hydrolyzate of the alkoxylated mixture of by-produced chlorosilicon compounds obtained from the reaction of methyl chloride and silicon.

The amount of the compound added, preferably in the core oil, is from 1 to 15 per cent by weight of the core oil. *Patent No. 2,967,-338 granted to R. H. Cooper and assigned to Dow Chemical Co.*

Mold Forming

Molding medium covered by this patent is foamed siliceous block. The casting cavity is formed by pressing the pattern into the block which breaks down the cell structure to conform to the desired shape. Gating system is formed in the same manner. Face of the cavity may be coated with heat-resistant material to fill any open pore areas to provide a smooth surface. *Patent No. 2,979,791 granted to J. W. North and assigned to Glasrock Products.*

SPOTLIGHT ON RUSSIAN CASTINGS PRODUCTION



Cover to cover translation of Liteinoe Proizvodstvo.

Liteinoe Proizvodstvo is the leading Russian periodical devoted to the foundry industry. It deals with all aspects of iron, steel and non-ferrous castings production in Russia, from raw materials to finished products, including their behavior. As a service to the foundry industry on both sides of the Atlantic, the British Cast Iron Research Association is publishing a cover to cover translation of this important journal each month. If you wish to keep up to date on current Russian practice—and their fresh approach to day-to-day problems, new techniques and metallurgical investigations are of interest to every go-ahead foundryman—a year's subscription is a worthwhile investment.

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- **Non-metallic inclusions in malleable iron**
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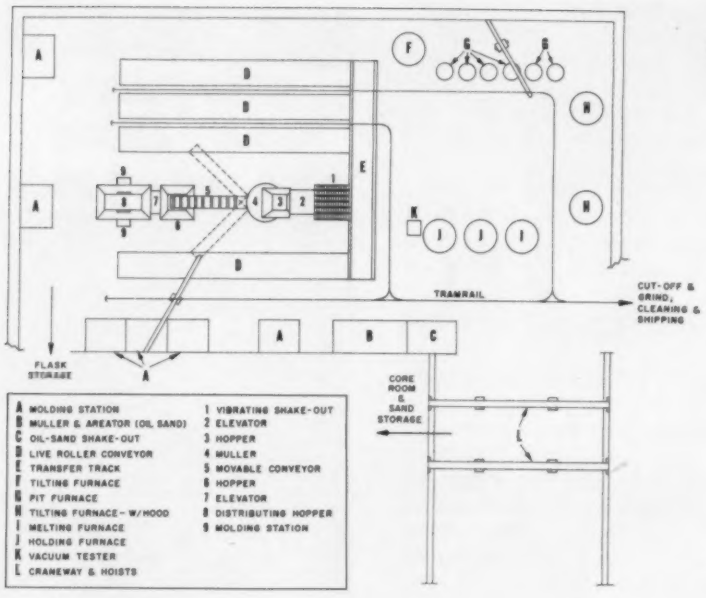

Diagram of foundry layout shows arrangement of equipment. Mechanization improved casting quality and working conditions and increased productivity in this jobbing shop

MECHANIZATION

in a Small Jobbing Shop

By ROBERT H. HERRMANN
Associate Editor

● MANAGERS of small job shop foundries consider mechanization from the same viewpoint as do the operators of larger foundries. They want better, more consistent casting quality, increased production capacity, and improved working conditions for employees.

Naturally, certain differences exist in the degree of mechanization required and in the type of equipment selected to meet the needs of different foundries. Quite often the prime deciding factor hinges on whether the main need of the foundry is for a high rate of production or for versatility of operation. Versatility is a major requirement of a jobbing shop, particularly the smaller operation.

The installation at R. B. Carolin Foundry & Machine Co., Detroit, is one example of how a jobbing shop satisfied its need for improved casting quality, better working conditions, and increased productivity. Currently, about 80 per cent of the castings output of this foundry is in bronze, 20 per cent in aluminum. The ratio varies with demand. Employment ranges between 25 and 50 people, depending on the state of business.

The company this year will begin its fiftieth year of continuous operation, having been established in 1912. It is said to be one of the oldest foundries in Michigan.

Bronze castings, mostly aluminum-bronze, include stamping dies, accurately cast billets for wear plates and blocks, and bushings. Aluminum castings, mostly 355 alloy, include bus bumper guards, pump bodies for hydraulic applications, aircraft structural parts, jigs and fixtures, test stands, and die stools.

Central Sand System—A vibrating shakeout, sand storage facilities, and muller form a central unit around which molding operations are conducted. Sand from shakeout falls to a vibrating screen on which lumps are broken by a roller. An oscillating conveyor under the screen carries the sand to a bucket elevator for deposit in a 10-ton storage bin.

Air cylinder-operated gates discharge sand to a 1000 lb batch hopper which empties into the muller. Molding sand generally is prepared in 1000-lb batches. Southern and western bentonite and water are added to maintain a moisture content of 4 per cent, green strength of 11 psi, and 60-80 permeability.

Prepared sand is discharged to an inclined belt conveyor leading to a surge storage hopper from which it flows to a bucket elevator for emptying into a divided hopper with two hand-operated discharge gates. A portable jolt rollover or a squeezer molding machine, as the job may require, or a wheelbarrow may be rolled under either of the discharge gates.

Molds made on the machines are set off to gravity roller conveyors situated on each side of the sand preparation center. The wheelbarrow is used to transport sand to heaps at a molding bench along one of the conveyors and to bench and squeezer machine stations at the end of the sand preparation center near the prepared sand storage hopper.

The inclined belt conveyor which carries sand from the muller is mounted with the bottom end pivoted and the top end supported by wheels on a quarter circle section of monorail. The belt can be swung 90 degrees to discharge sand beyond the roller conveyors on one side of the sand center. The sand is used for bench work or for machine molding on one portable squeezer and two portable jolt squeezers.

Use Petroleum Sand — Another squeezer machine in this area makes molds of petroleum-bonded sand

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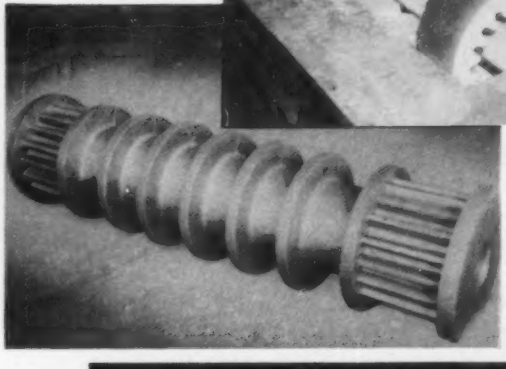
Example: Rosedale Foundry and Machine Company, of Pittsburgh, used KOLD-KURE to produce 39,000 lb. core shown above being lowered into pit. In-plant Service by a KOLD-KURE man!



KOLD-KURE core and mold assembly, mold faced only. Pinion core made in one piece.

Driver roller, alloy steel casting. Weight 2450 lbs.; 12 ft. long, 19" diameter. Photo was taken after shot blasting.

No off-the-shelf item, KOLD-KURE is part of a highly-adjustable process . . . and we believe its great success can be traced largely to detailed in-plant service by our Technical Representatives. *If you are interested in trying the No-Bake process or in improving its performance . . .* let the KOLD-KURE man study your processing and make a recommendation in conjunction with our laboratory's evaluation. The recommendation is only the beginning, for he'll work closely with your personnel in core and mold preparation to prove its merit in your foundry. *Phone us collect about the "Show-Me" Proposal . . . or ask for 16-page Technical Bulletin.*

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For More Information Circle 628, Page 39

prepared in a portable muller near the machine. This sand mix is used for work requiring deep draws or a comparatively smooth finish or for molds which might have to set for a time before they can be poured.

Cranes Handle Heavy Molds

Jib and monorail cranes equipped with electric hoists for handling heavy molds are mounted in the molding areas just described. A roller-top, wheeled car is pushed on floor rails along the ends of the roller conveyors on which molds are set and poured. Top of the car aligns with the 16-in.-high roller conveyors to receive poured molds for movement to the vibrating shakeout.

A separate area is devoted to the making of molds weighing up to 10 tons in flasks up to 3 x 12 ft and 9 ft square. Sodium silicate, CO_2 cured, sand facing often is used in the larger molds to reduce the need for reinforcing bars and to avoid buckling of the cope face. These large molds are broken out on the floor.

Melting—All melting and holding furnaces are gas fired. Six pit, No. 100 crucible units for bronze are aligned along a wall. A jib crane with hand hoist is used for removing the crucibles. Ingot and scrap segregated according to analysis is stored in bins opposite the line of furnaces. Three No. 400 tilting furnaces also are used for melting bronze.

Three dip-out furnaces aligned behind the metal storage bins are used primarily for melting aluminum alloys. These furnaces also will hold a No. 200 crucible for melting bronze when increased metal demand requires the added capacity.

Crucibles of molten metal are put in two-man pouring shanks held in a bail on a hand hoist suspended from a monorail dolly. Switches in the monorail system permit pushing the crucible along any of the furnaces and roller conveyors on which molds are set or into the floor molding areas. The monorail also extends into the cleaning room and most castings are loaded into monorail carriers for movement to cleaning equipment.

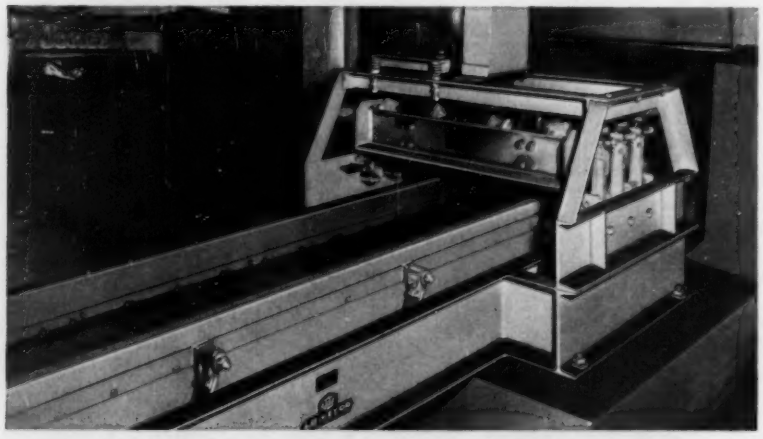
Castings Cleaning—The cleaning room is a long, comparatively narrow rectangle. The monorail is mounted along the centerline with equipment along the walls on each side.

The gating metal is removed and castings are cleaned with two band saws, two table-mounted cut-off wheels, a reach-in blast machine, three double end stand grinders, and with portable power tools at a bench.

Coremaking—Three blowers and two bench work stations are employed in the making of cores. Green cores on plates are loaded on racks for low lift truck movement into two gas-fired batch-type ovens.

Sand batches are prepared in a small, wheeled muller. Mixes consist of 120 lb of AFS 48 sharp sand, 120 lb AFS bank sand, 2 gal water, 1 gal corn flour, 1 qt kerosine, as well as 1½ lb fast baking resin binder.

The foundry has a well-equipped pattern shop, a maintenance shop, and a small sand laboratory. All areas of the foundry are lighted by fluorescent fixtures. Ceiling fans exhaust contaminated air from working areas.



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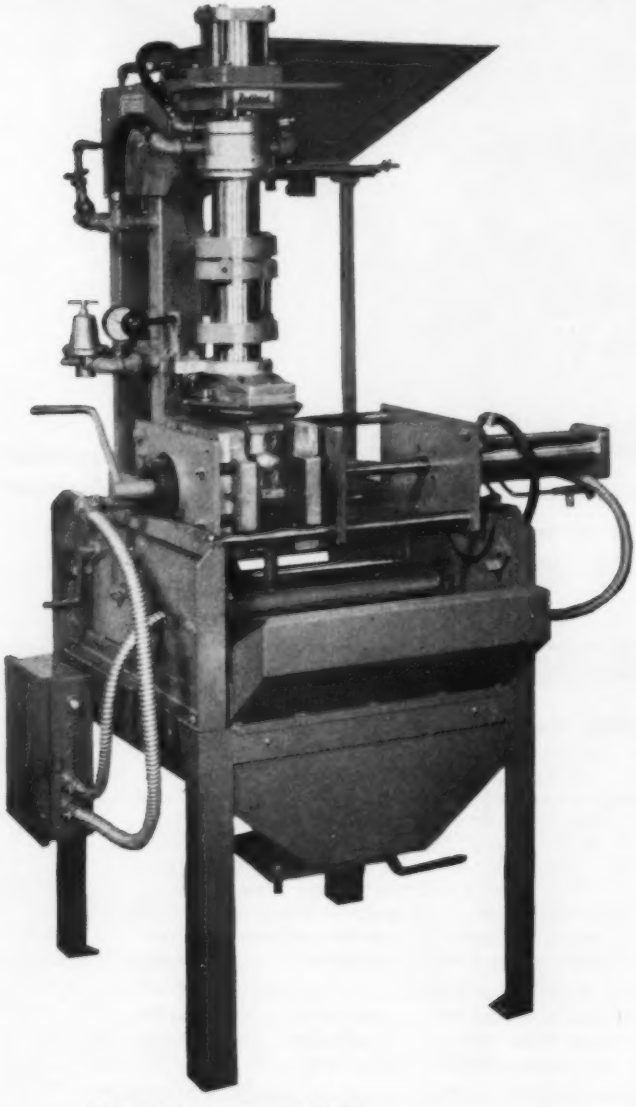
SHELL CORE BLOWER



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The HP-4 Redford has ample blow capacity and can also be used to blow Furfural resin sand mixes into heated core boxes.

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For More Information Circle 630, Page 39

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C. H. Schweinsberg, Harbison-Walker Refractories Co., standing, spoke about aluminum furnace refractories at a Diecasting and Permanent Mold session

AFS Congress Technical Reports

These reports conclude FOUNDRY's complete, on-the-scene coverage of technical sessions at the 65th AFS Castings Congress, held May 8-12, in San Francisco. Subjects covered this month include Diecasting and Permanent Molding; Ductile Iron; Sand; Vacuum Melting; Fundamental Papers; Plant & Plant Equipment, and Steel. Other reports were presented in our June issue, p. 142

Diecasting & Permanent Mold

● A TOTAL of 11 papers on diecasting and permanent mold casting topics was presented at four technical sessions and a Die Casting and Permanent Mold Division roundtable luncheon.

Subjects discussed included aluminum diecasting soundness, mechanical and thermal aspects of diecasting, aluminum furnace refractories, tilt pouring of permanent mold castings, permanent mold design, aluminum alloy composition, aluminum melting practice, diecasting trimming, and porosity in zinc diecastings.

Maximizing Soundness in Aluminum Die Castings, by L. M. Elijah, George Sall Metals Co., Philadelphia. Presented by R. P. Dunn, Lindberg Engineering Co., Chicago. Defects fall into three categories—those which require correction before, during, or after injection of metal into the die cavity.

In the first category, the most common problem is porosity, caused by gas in the melt as the result of improper treatment of molten metal. Melting requires clean, dry metal which should not be overheated and should be degassed. Other sources of trouble include violent stirring, too much die lubricant, and poor venting.

During injection, likely dangers include coldshuts, shrinkage, flow lines, seams, and die soldering. Coldshuts, or failure to fill part of the die cavity, can be caused by the folding of excessive lubricant into the metal. Other steps include the following: If the die is cold, increase its temperature. Locate cooling channels at a proper distance from the die cavity. Check venting and gating, and improve fluidity of metal by good melting practice.

Shrinkage cracks occur when stresses during cooling exceed the mechanical properties of the alloy. Hot-short alloys should be avoided. Shrinkage depressions result from inadequate feeding of adjacent heavy and thin sections. Avoiding hot spots requires proper feeding, adjustment of sections, and use of 0.9 to 1.3 per cent iron in metal.

Flow lines are caused by excessive die lubricant, improper gating or venting, or die temperature which is too low. Seams, or failure of two metal fronts to fuse, require attention to die temperature and venting. Elimination of die soldering requires proper metal temperature, clean die surfaces, and gating which does not impinge metal on critical areas of the die.

The category of defects after injection, or extruded surface defects, includes flaws caused by heavy sections, premature casting removal, and gas.

A number of the author's statements, including those about gas, need for iron in the melt, and other points, were challenged during the discussion.

Fundamental Mechanical and Thermal Aspects of Die Casting, by A. B. Draper, Pennsylvania State University, University Park, Pa. This report summarizes work of a number of investigators in the

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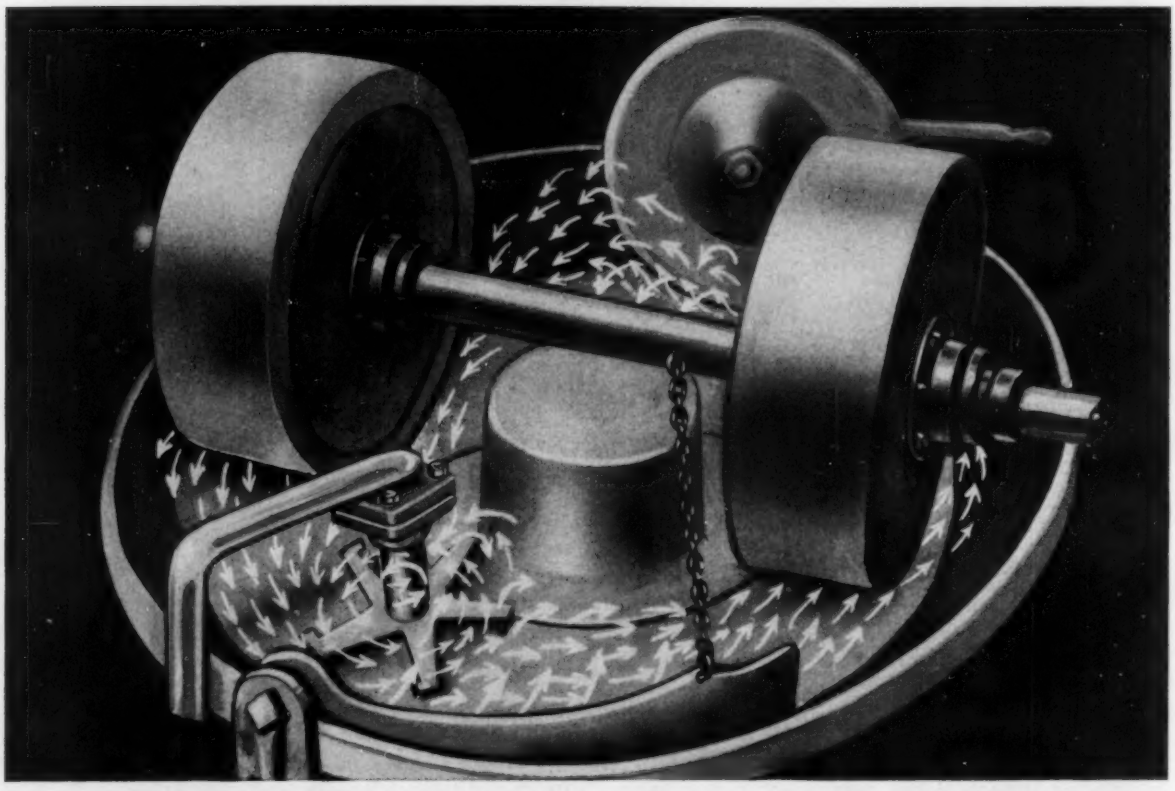

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areas of fluid flow in diecasting, die gating and venting, and thermal aspects of die filling. These principles of diecasting evolve from their work:

1. Molten metal leaves the gate in a jet with a cross section shaped like the gate, traverses the mold, impinges on the opposite wall, and follows the contour of the die wall. 2. Overflow wells and vents should be located so that they will not be sealed off prematurely by metal. 3. Wherever practical, only one gate should be used. 4. If several gates are required, they should be designed not to create turbulence.

5. A diecasting should be gated through a thin section into a heavy section wherever possible. 6. A gate should be located along an edge from which it can be sheared cleanly in trimming. 7. Gate so that injected metal does not impinge directly on a core. Otherwise, increase cross-sectional area of the gate to reduce core erosion. 8. Gate area should be such that the cavity fills in from 0.030 to 0.100 sec for small and medium-sized castings.

9. Turbulence can be minimized if the ratio of gate area to cavity cross-sectional area is less than one-third. 10. Overflow wells serve as reservoirs for air within cavity and as heat reservoirs for cooler portions of the die. They also should draw off skimmings and the initial flow of cold metal. 11. Although commercial practice uses gates from 0.008 to 0.016 in., they should not be more than 0.004 in. thick according to one authority.

12. Vacuum diecasting currently is most useful when deep, thin sections must be filled. 13. Runners should be trapezoidal in cross section to reduce air entrapment in the molten metal stream. 14. The energy of moving metal is changed to heat during the injection cycle and at the moment of impact. If the injection pressure is 10,000 psi, the temperature rise is about 52° F.

Aluminum Furnace Refractories, by C. H. Schweinsberg and J. L. Dolph, Harbison-Walker Refractories Co., Pittsburgh. Presented by Mr. Schweinsberg. A good compromise between fireclay brick (which is penetrated by molten aluminum) and 80 to 90 per cent alumina brick (which gives excellent service) is 60 per cent alumina brick. The 99 per cent alumina brick is ideal but costly. A new type of 85 per cent alumina with a special chemical bond gives better service than other high-alumina brick.

Silicon carbide and nitride-bonded silicon carbide are good but costly, as is zircon brick, which has low impact strength. Each is used for particular applications in which they provide special advantages. High-duty fireclay brick is used widely and has given good service in many instances, especially with impregnation by molten salts.

The ideal hearth refractory for melting furnaces resists penetration, has good mechanical properties, and cleans easily.

Tilt Pouring Permanent Mold Castings, by G. W. Stahl, Stahl Specialty Co., Kingsville, Mo. To reduce air entrapment during pouring, permanent mold foundrymen often develop special gating systems which have other drawbacks such as loss of time and money. A different approach is to use simple gating systems and to tilt molds during pouring.

Tests were run on a 13-lb wood planer base test casting. The mold was machined from a gray iron casting and weighed 425 lb. Clamping pressure was about 12,000 lb. The mold was coated with vermiculite, heated, and put in the machine, which tilts the mold after the two pouring basins have been filled. The mold stabilized at 750° F after 12 castings, and pouring required 25 seconds.

It took 26 castings to get 25 good ones with tilt pouring and 32 castings to get 25 good ones with vertical pouring. The latter required two operators. In the vertical-poured castings, turbulence with voids up to 0.08 in. occurred in a crucial spot where there were no voids in the tilt-poured castings. In addition, tilt-poured castings showed better control of flash and were more nearly uniform in color and quality.

"How many times do I have to tell you, 'If it's too heavy, get someone to help you'?"

Permanent Mold Design, by John Wall, Permanent Mold Die Co., Hazel Park, Mich. Presented by Frank S. Ross, Permanent Mold Die Co. High chilling in permanent molds gives excellent mechanical properties and speeds production. The gating system should make metal enter so that it yields the best properties, uses the least amount of gating metal, and permits mechanical trimming.

High production requirements are changing the design of molds and methods. Revolving and tilting molds, automatic pouring, automatic ejection and extraction, and other innovations are new developments eliminating the human factor.

Coatings, however, are essential to permanent mold casting to protect molds, and their application still requires some human artistry. They should be applied uniformly, usually under 1/10,000 in. in mold cavity, but heavier in riser and runner areas. Molds generally alter during first use and require readjustment before subsequent use.

Permanent mold castings are superior to diecastings because they yield better properties, lower cost, and equal or better cycle time. Porosity is more of a problem in diecasting. Permanent mold castings can be made with higher strength alloys and can be heat treated.

During discussion, there was considerable debate on the relative advantages of permanent mold castings and diecastings.

Metals in Space, by J. C. McDonald, Lockheed Missile & Space Div., Lockheed Aircraft Corp., Sunnyvale, Calif. Performance of metals is of vast importance to the man-in-space program, as for example in a rocket firing chamber during lift-off and re-entry. Higher melting point metals are required. Other major problems involve absorptance and emittance of heat, resistance to vapor pressure (metal evaporation),

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Ingot mold flask (for steel mill use) weighing 18,500 lbs., being inspected by Metal Blast's abrasive engineer, *prior* to blast cleaning with "SUPER-STEEL" shot.

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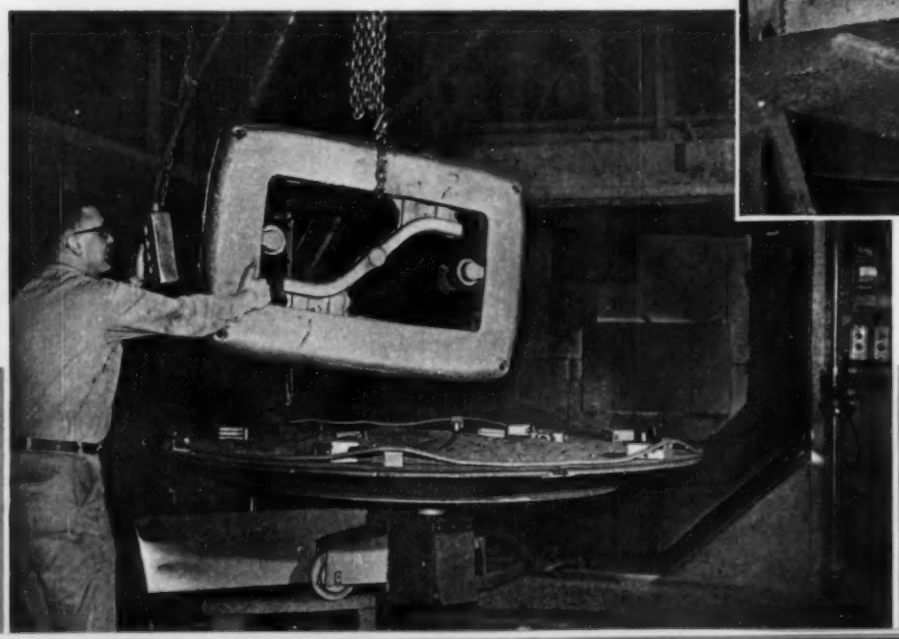
Ingot mold flask weighing 11,300 lbs., *after* cleaning with "SUPER-STEEL" shot.



Ingot mold hot top cover, 493 lbs., *after* cleaning with "SUPER-STEEL" shot.

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For More Information Circle 633, Page 39

thermal conductivity, latent heat, and lubrication of parts in motion relative to each other in space.

Inclusions in Aluminum Alloy Castings, by J. M. Fox, Aluminum Co. of America, Cleveland. Presented by Walter E. Sicha, Aluminum Co. of America. Inclusions usually are associated with gas-caused voids, and some therefore appear dark on radiographic slides. Some, like spinel, a combined aluminum and magnesium oxide, are hard, and they tear casting surfaces during buffing. Methods of detecting inclusions include visual and microscopic examination, chemical analysis, and x-ray diffraction. Sources of inclusions include the alloy itself and the furnace refractories.

Both metallic and nonmetallic types occur, and both can be identified by either metallography or x-ray diffraction. Iron-manganese inclusions can result when sludge has formed in the holding furnace, and massive inclusions are possible when conditions are bad enough.

Oxides of aluminum and magnesium are the biggest problem, and their formation can be avoided by the following precautions: Reducing holding time, cleaning furnace walls, using high-alumina refractories, not using a higher temperature than necessary. The melt should be agitated as little as possible.

When oxides have formed in the melt, a salt flux may help to reduce them, or the melt can be held until the oxides either sink or float. Steps which help to avoid metallic segregation including raising melt temperature and stirring the metal to keep it mixed.

Minor Elements in Aluminum Alloys for Die and Permanent Mold Casting, by D. L. Colwell and R. J. Kissling, Apex Smelting Co., Cleveland. Presented by Mr. Colwell. Silicon and copper are the most common aluminum alloying elements, but others also are present—some injurious, some not.

Iron always is present. Superior permanent mold casting properties—especially elongation—are possible with low iron content. In diecasting alloys, iron in the range from 0.8 to 1.2 per cent is beneficial. It helps castability and reduces soldering. It also reduces elongation and impact strength, but doesn't do much to tensile strength.

Zinc up to 3 per cent improves machinability and yield strength. Tensile strength is not hurt except in marine exposures. Elongation is reduced, but only as a result of corrosion.

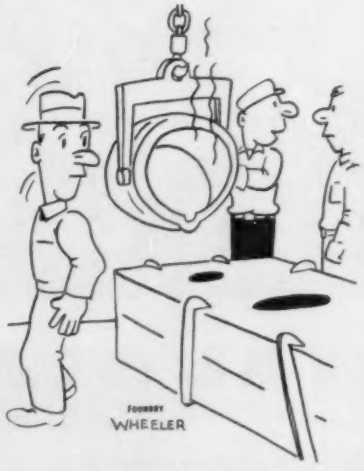
Except in alloys specifically calling for it, magnesium is limited to 0.1 per cent because it is harmful in common silicon-copper alloys. It hardens those alloys by reducing elongation and increasing brittleness and hot shortness. It may raise tensile strength, but hurts castability.

Manganese has a hardening, embrittling effect on most permanent mold alloys, but has desirable effects on some, such as piston alloys. In diecasting, it can facilitate sludge formation but has little effect on alloy properties and aids castability. It is desirable up to half the iron content—to 0.5 per cent.

During the discussion there was some disagreement with the speaker's remarks about the value of iron and zinc in diecasting alloys.

Iron: The Problematic Factor in the Quality of Aluminum Alloy Die Castings, by Walter Bonsack, Aluminum & Magnesium Inc., Sandusky, Ohio. The diecaster's greatest problem is machinability, which is decreased by iron. Even when two diecasters use the same alloy, varying iron contents in the sludge can cause different machinability in castings.

The absence of iron in permanent mold and sand castings raises their strength, and diecasting should get the best properties of all aluminum castings because it provides the most chill. Strengths of 80,000 psi with 25 per cent elongation should be achieved. Iron holds down properties regardless of all other aspects of diecasting practice.



"Well, here goes nothing"

Although diecasters say they need high iron content to prevent sticking to the die, alloys with as little as from 0.15 to 0.5 per cent Fe have been diecast without sticking. Actually, diecasters use iron as a crutch and as a matter of habit. Iron forms cleavage planes and lowers mechanical properties of aluminum alloys. The diecaster adds manganese to disperse the iron, but iron forms up to 18 compounds, some of which impair appearance and machinability.

Die Casting Trim Die Procedure, by D. Hannah, Hamco Products, Warren, Mich. Presented by Nicholas Sheptak, Dow Metal Products Co., Midland, Mich. A good diecasting trim die must locate castings quickly, remove all flash, gating, and other excess metal, and be easily removable from the die. It should be inexpensive and durable. The type of steel used depends on the application and its difficulty. Stellite inserts can be used on mild steel types.

A layout should be made showing gates, runners, vents, overflows, etc., before the trim die is made. The trim die should be made at the same time as the diecasting die and should reflect any changes in the diecasting die.

Safety always must be considered in trim die design. The trim press operator never should put his hands under the trim edges.

A Study of the Nature of Porosity in Zinc Die Castings, by G. P. Lewis, D. A. Craw, and R. C. Bell, Consolidated Mining & Smelting Co. of Canada, Trail, B. C., Canada. Presented by Mr. Lewis. Proper die design and operating techniques can control porosity and restrict it to the interior of castings, but porosity is inherent in the diecasting process. Without control, castings can contain such gross porosity as to make plating impossible or to cause failure in use.

Laboratory tests on castings were used to determine density, gas content, and nature of the gas present. Gas bubbles can form in the cast-

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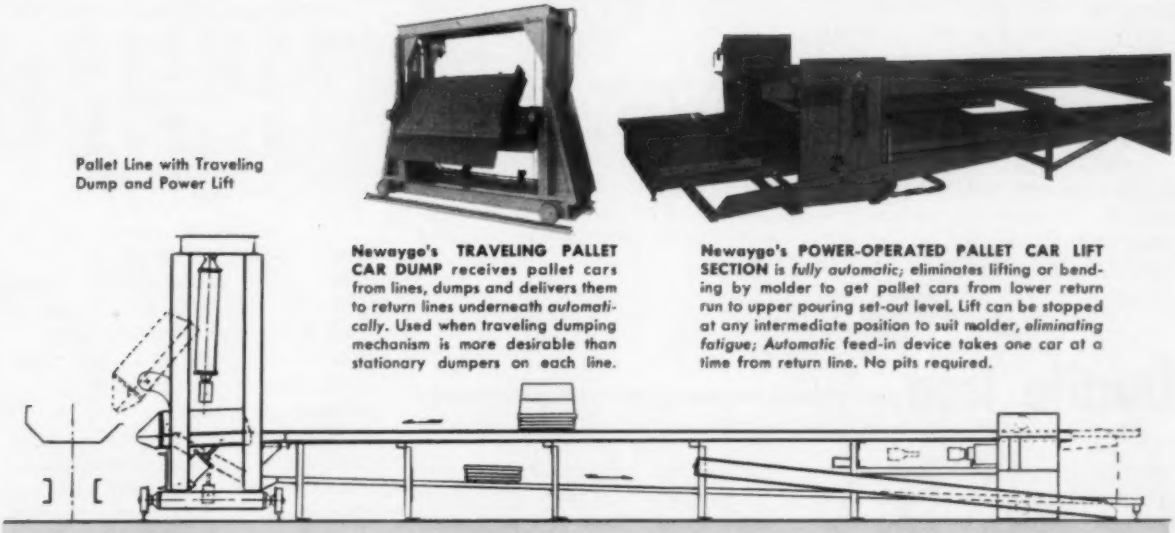

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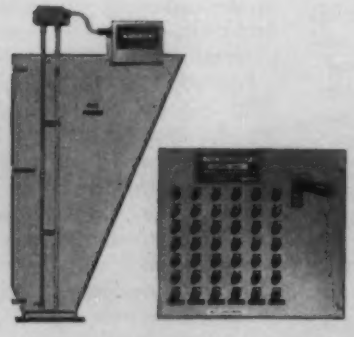

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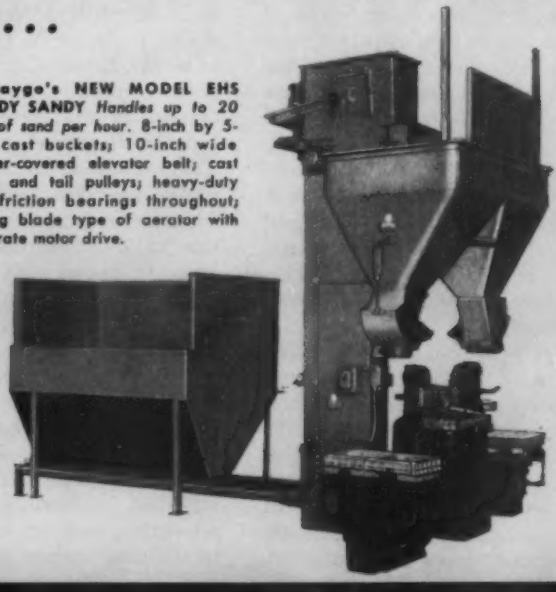

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For More Information Circle 634, Page 39

ing cavity, contracting under pressure as metal solidifies around it, then expanding when feeding has stopped and the casting is losing density because of unfed solidification shrinkage. There seems to be no relationship between surface porosity and unfed solidification shrinkage in the interior of the casting.

Sources of gas include the atmosphere, the metal, and to a small degree, die lubricants. Atmospheric gas varies with heat and humidity. The chief gases are hydrogen and nitrogen, mostly from the atmosphere, although hydrogen also can result from moisture in the melt.

Tests showed that lowering injection pressure reduced gas content but increased its volume, lowering over-all density of the casting. Lubricants had little effect on density and gas. The fact that gross porosity is associated with unfed shrinkage solidification indicates the importance of thermal conditions in the die.

Going from conventional diecasting to vacuum diecasting reduced gas content about 25 per cent and volume of voids about 20 per cent. The vacuum was 21 in. Hg, with the evacuation made and held during the shot. The vacuum probably would have been more effective except that the nonvacuum samples were remarkably sound.

The work done shows the importance of die design—especially of gating and vents. It also indicates the need to compromise between surface quality and internal quality. The gating has to be directed to the achievement of one or the other.

Ductile Iron

● VARIOUS PHASES relating to ductile iron were discussed in three sessions. Topics include magnesium analysis, graphite structures, classification of graphite forms, effect of composition, formation of graphite, and post inoculation. Report of the Ductile Iron Research Committee dealt with the following subjects.

Reliability of Magnesium Analysis as a Criterion of Ductile Iron Quality, by A. H. Rauch, Deere & Co., Moline, Ill., and H. G. Haines, Woodruff & Edwards Inc., Elgin, Ill., and presented by David Matter, Ohio Ferro-Alloys Corp., Canton, Ohio.

Study involved analytical results obtained from two commercial, one research, and six producer laboratories which showed variations. No standard drillings are available as in the case of iron, steel, etc.—each laboratory developed its own. In most cases, however, individual determinations would be satisfactory for in-plant control. The variations were attributed to segregation and other factors. Consensus is that amount of magnesium should not be a criterion of quality because it varies from foundry to foundry according to practices employed. Microscopic examination of test coupons for the structure is the best method for judging their quality.

Graphite Structures in Heavy Castings of Nickel Alloyed Austenitic Ductile Iron, by I. Karsay and R. D. Schelleng, International Nickel Co., Bayonne, N. J., and presented by Mr. Karsay. Occurrence of abnormal graphite in heavy ductile castings of the austenitic type alloyed with nickel was discussed. That condition is visible to the naked eye, and under usual microscopic examination appears similar to interdendritic or type D graphite, but at high magnification is shown to be particles of spheroidal graphite.

Since presence of that structure leads to lower physical properties, studies were made to determine the cause. It was determined that high total carbon and nickel contents were responsible. The authors established a formula, termed the saturation number, which is equal to the total carbon plus 0.2 Si and 0.06 Ni. The saturation number should not exceed 4.5 or be below 4.4. Additions of cerium to the nickel-alloyed material caused appearance of the abnormal graphite, termed chunky graphite.

Classification of Graphite Forms in Nodular or Ductile Irons, by C. K. Donoho, American Cast Iron Pipe Co., Birmingham. Presented by Ralph Carlson, melting superintendent, Acipco.

The need was cited to classify graphite structure according to certain designations to reduce growing confusion caused by several domestic and foreign specifications. Two charts showing five types of ductile iron graphite and graphite particle sizes were described and suggested for use in classification until international specifications are set up.

Effect of Chemical Composition on Graphite Structures in Heavy Ductile Iron Castings, by I. Karsay and R. D. Schelleng, International Nickel Co., Bayonne, N. J. Presented by Mr. Schelleng.

Test castings of varying section size to 10 x 10 x 10 in. were produced. Test results showed that a content of 0.04-0.05 Mg is optimum. Full spheroidal graphite, however, was attained with 0.03 Mg. Some flake graphite results with higher magnesium contents.

Higher carbon contents produced well-shaped graphite, but mechanical properties of the iron were not appreciably better. Lower carbon irons had graphite particles of improved shape and some improvement in elongation. In general, eutectic or hypereutectic irons have greater sphericity of graphite and better elongation but show no improvement in tensile properties.

Formation of Flake, Spheroidal, Film and Compact Graphite During Solidification of Cast Iron, by Carl R. Loper Jr. and Richard W. Heine, University of Wisconsin, Madison, Wis., and presented by Mr. Loper. Magnesium acts as a desulfurizer, extends the freezing range of the iron, nucleates graphite spheroids, and prevents eutectic graphite cell formation.

By suitable treatment of the iron with magnesium, the graphite spheroids form within an austenite shell and continue to grow over a temperature range. If the austenite shell or envelope is fractured, however, and the graphite spheroids come in contact with the melt, they change to some type of flake graphite. Indications are that spheroids form in the range 2400 to 2500° F and grow around 2200°.

Post Inoculation of Ductile Iron, by Warren C. Jeffery, McWane

Circle 635, Page 39→

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Edwin Bremer, metallurgical editor, FOUNDRY, third from left, talks over the program at a Ductile Iron session with, left to right, K. H. Hapgood, H. C. Macaulay Foundry Co., secretary; David Matter, Ohio Ferro-Alloys Corp.; K. D. Millis, International Nickel Co., chairman; and Istvan Karsay and R. D. Schelleng, International Nickel Co., co-authors of a paper at the session

Cast Iron Pipe Co., Birmingham, and H. D. Bradshaw, University of Alabama, University, Ala., and presented by Mr. Jeffery.

Investigation showed that the best physical properties, including impact resistance, in ductile iron are obtained by post inoculation with ferrosilicon containing calcium and magnesium. In the study the iron was treated with pure magnesium by a graphite plunger. Iron was at 2800° F in 100-lb ladles. Reaction required 75 seconds to start, and was completed 150 seconds later. Post inoculation was accomplished by pouring the treated iron over the ferrosilicon in another ladle.

It also was found that the iron should be poured from 3 to 6 minutes after inoculation since after 6 minutes there was a gradual falling off in properties.

Core and Molding Sand

● MOLDING materials and their behavior, hot box cores, sand testing and control methods, casting defects classification, and the effect of grain size were covered in 15 papers at six Sand Division sessions.

Preliminary Evaluation of Calcined Fluid Coke, by E. G. Gentry and C. L. Lear, Humble Oil & Refining Co., Detroit. Presented by Mr. Gentry. Fluid coke, commonly called carbon sand, is a hard, round grain carbon material made from heavy residual oils. It has almost no fines, and an expansion under heat of one-eighth that of silica sand.

The material has been used in green sand molds, baked oil cores, and in shell molds. Castings poured with commercial aluminum, bronze, and gray iron show smooth surface finish, and the mold and core mixes have good peel characteristics. (See "Carbon Sand Minimizes Penetration," June FOUNDRY, p. 170.)

Improvements in the CO_2 Process, by D. A. Taylor, British Cast Iron Research Association, Alvechurch, Birmingham, England. Two major improvements, mainly economical, resulted from experimental work. A wider range of sands than previously thought possible can be used with the process. Mixtures of up to 50 per cent discarded, burnt heap sand were used with better results than obtained from use of all clean, pure silica sand.

Mixtures of half compressed air and half CO_2 produced a uniformly cured mold or core with considerable saving in cost of gas. The saving results from reducing wastage of CO_2. The study showed that 1.6 cu ft of CO_2, regardless of its concentration, is required for curing each pound of sodium silicate in the sand mix.

A New Approach to Testing the High-Temperature Strength of Molding and Core Sands, by R. W. Heine, University of Wisconsin, Madison, Wis., and J. S. Schumacher and E. H. King, Hill & Griffith Co., Cincinnati. Presented by Professor Heine.

Current high temperature sand tests employ cylindrical specimens and measure an approach to equilibrium properties. The new tests measure properties at a rate of heating over a period of time, and tubular test specimens with 5/16-in. wall sections and $1\frac{1}{8}$-in. OD are employed.

The new test specimen is said to provide conditions similar to those existing in the first $\frac{1}{4}$ in. of mold from the mold metal interface. Also the time-temperature relationship with regard to hot strength is said to more nearly approximate actual foundry conditions.

Granular Movement During Squeezing, by D. C. Williams, Ohio State University, Columbus, Ohio. The subject of granular movement first was introduced 100 years ago, and the present report is based on previous work by Terzaghi and others.

These men worked out methods of determining how sand grains slide under squeezing and jolting. Their methods are based on soil mechanics as applied with equal and similar validity to road building, construction, and similar applications. They apply similarly to foundry sands.

Discussion brought out the assertion that tensile and shear strength can be determined more accurately than compression strength. Tests show, it was stated, that compression does not follow the principles discussed when standard AFS tests are used. The fault may be with the length of the specimen employed.

Mr. Williams replied that any of the three strengths involved can be determined when the other two are known. More accurate tests than those now used are possible. Replying to a question about flow-

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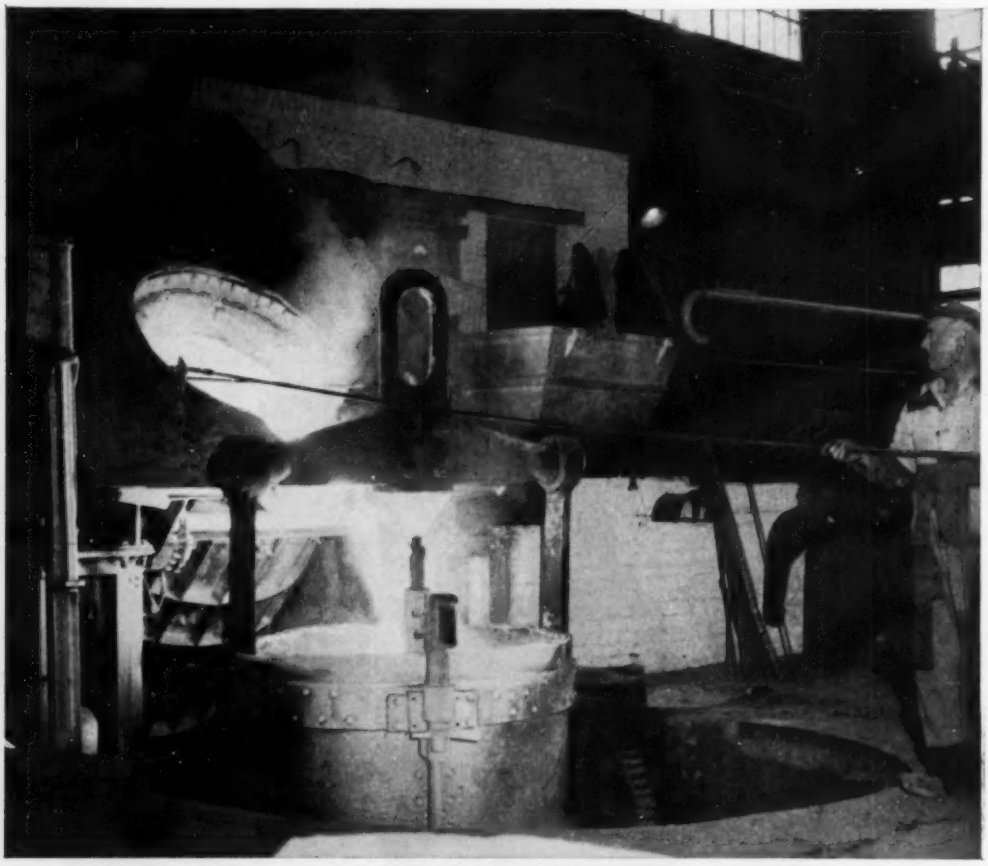

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ability, he said that soil mechanics gives a formula for flow value or flowability, which is related directly to the angle of friction.

A Systematic Approach to Sand Design and Control—Dry Properties of Clay Bonded Sand, by G. J. Vingas and A. H. Zrimsek, Magnet Cove Barium Corp., Arlington Heights, Ill. Presented by Mr. Zrimsek. This report, the second in a series presenting basic data on the effects of a number of variables on foundry sands, deals with western and southern bentonite and fire clay.

Intelligent discussion of the physical properties of clay bonded sands is impossible without thorough understanding of the function of mulling as a variable. Foundrymen have a tendency to oversimplify and make generalizations, but it doesn't follow that a generalization holds in a given set of circumstances.

Data accumulated in these reports, for example, show that virtually any combination of physical properties is obtainable through variations in clay and water contents and mulling efficiency. Results depend more on mulling than on the sand or clay used, and the superiority of western bentonite over southern is more pronounced as mulling becomes more efficient. The bentonites showed better results than fire clay. Uniform results were obtained with seven western bentonites and three southern. All tests were made with new, freshly mulled facing sand only. A 51 fineness, four-screen silica sand was used.

A Microscopic Study of the Bonding of Steel Foundry Sands by Clay, by J. B. Caine, consultant, Cincinnati, and E. H. King, president, and J. S. Schumacher, vice president, Hill & Griffith Co., Cincinnati. Microscopic examination of steel foundry sands cast doubts on accepted theories for clay film thickness and clay distribution by mulling. This paper describes methods for microscopic examination.

References in literature to clay film thickness and the effect of mulling on clay distribution reveal that in most cases a uniform distribution of the bond clay about the sand grain is assumed but not proved. In mulling studies clay distribution is assumed to be better when green strength increases. Green strength does increase with mulling up to a point, but this is no proof that distribution in itself has changed.

Results of the study indicated:

1. Theories of uniform distribution of clay substance on sand grains and clay film thickness, within the ranges of clay content and water used in the steel foundry, are possibly in error.

2. Mulling over short intervals of time does not increase clay distribution as evaluated by this paper. The increase in green and dry strengths with increased mulling may not be due primarily to improved distribution of the bond. The increase in green strength may be detrimental in that moldability is decreased. The role of dry strength in steel sands is not clearly understood.

A Systematic Approach to Sand Design and Control—Effect of Mulling, by G. J. Vingas, research engineer, and A. H. Zrimsek, foundry engineer, Magnet Cove Barium Corp., Arlington Heights, Ill. Two previous reports of this series showed conclusively that mulling must be considered a major variable to the extent that it often overshadows clay type and clay content in new sand-clay-water systems.

In actual foundry practice, however, castings of approximately equal quality are being produced in sands mulled for extensive periods, ones not mulled at all, and all points in between. To help clarify the importance of mulling, this separate study deals with the effects of mulling on the physical properties of simple sand-clay-water systems. The clays investigated were western and southern bentonite and fireclay.

"May I suggest that you use a smaller strainer core or a larger sprue in that mold?"

Conclusions: Dry sands are influenced by mulling to a greater extent than wet sands. Mulling efficiency decreases with increased clay at low water contents.

Western bentonite sands respond to mulling at a slower rate than fireclay and southern bentonite sands, in that order.

At high water levels, sands bonded with any of the three clay types experience a drop in green physical with extended mulling. Fireclay and southern bentonite sands also experience a drop in dry physicals.

Addition of water to sand followed by clay rather than clay addition followed by water is the more efficient method of additions.

There is a significant difference in the mulling performance of various mullers.

Precision in the Foundry, by A. Short, manager, Rolls-Royce Ltd., Derby, England. Officially sponsored paper from the Institute of British Foundrymen. Precision castings are the goal of all foundrymen, but many are not aware of latest practices and techniques. Furthermore, newer members of the foundry industry have not availed themselves of the knowledge of older members. A b l e n d i n g of these knowledges will advance the industry.

There are no completely dimensionally accurate castings although there are close-tolerance castings. It is difficult to calculate for shrinkage, and alloys shrink in the heat treating which is performed to develop maximum physical properties. Additionally, extreme accuracy costs money and today there is much stress on the importance of economy in manufacture.

Progress Report, Castings Defects Handbook R e v i s i o n Committee (8-S), Sand Division, by T. E. Barlow, International M i n e r a l s & Chemical Co., Skokie, Ill.

Numerous photographs of various casting defects in ferrous and nonferrous castings were shown. Methods of eliminating the defects were discussed. The illustrations and discussions are to be included in the

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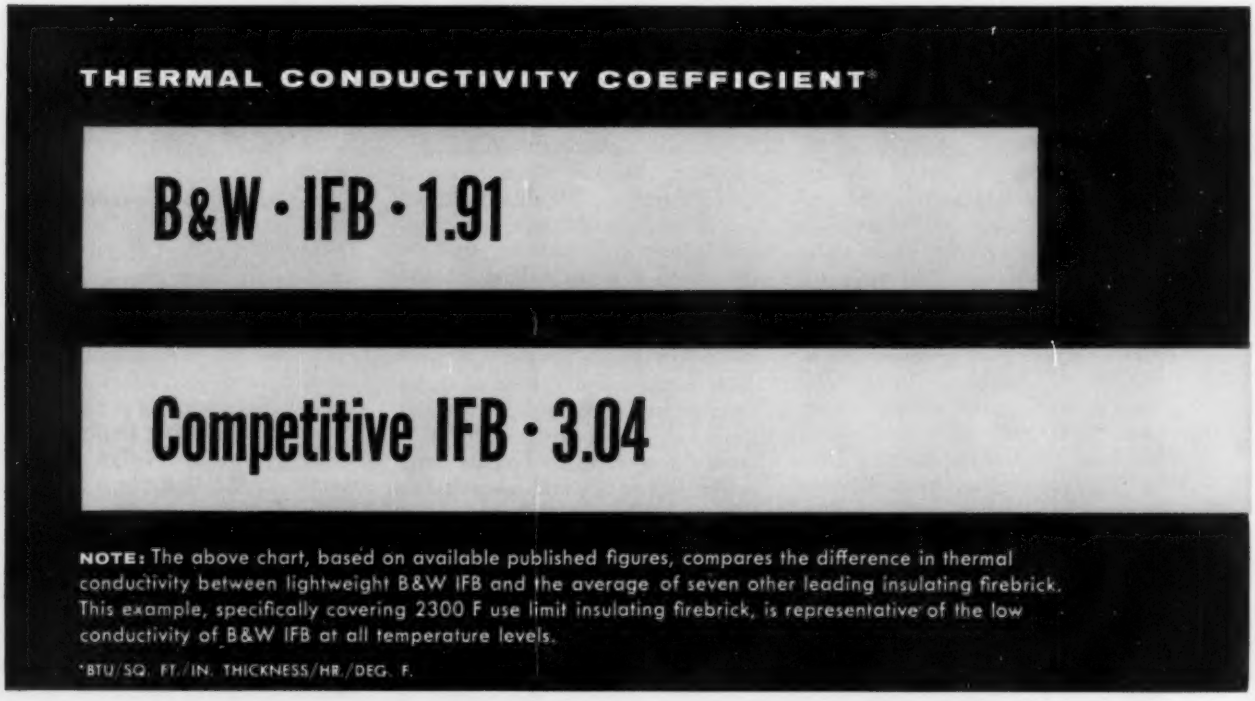
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revised AFS handbook dealing with castings defects.

Core Production in "Hot Boxes" at the Renault Works, by Philippe Jasson, Renault, Billancourt Seine, Paris, France. Presented by Wayne H. Buell, Aristo Corp., Detroit.

Thermosetting binders, used by this company in blowing cores for cylinder heads, manifolds, and miscellaneous small castings, generally consist of sugars fortified with urea formaldehyde plus a catalyst. Some cores also are made by ramming and squeezing.

Sand used should be clay-free. Green strength is low but excess water slows the baking cycle. Tensile strength is high, exceeding those of oil-sand cores, shell cores, and cores made with a binder having a pure sugar base.

Production is mechanized through use of automatic, multiple-station machines capable of turning out 240 cores an hour. Electrical resistance units are incorporated in the corebboxes, which are made of iron. Little application has been made of the process to molds except for some stack molding work.

A Study of Molding Sand Toughness, by T. E. Barlow, International Minerals & Chemical Co., Skokie, Ill., and H. W. Dietert, Harry W. Dietert Co., Detroit. Presented by Mr. Dietert.

A new method of measuring molding sand toughness is called jolt toughness. It employs the principle of the AFS core impact test but uses a longer overhang and a different specimen holder. The relationship between various molding sand properties and jolt toughness of sand can be used to start a control program which will lead to better rammed molds.

Studies with the method led to these conclusions: Jolt toughness of sand is not greatly affected by a change in grain fineness; bentonite-bonded sands without additives rapidly develop a jolt toughness and then reduce in toughness as temper is approached; silica flour additions materially reduce jolt toughness; cereal and seacoal additions have considerable effect on jolt toughness of bentonite-bonded sand; a combination of an additive and improper moisture can lead to lower mold hardness and greater false void spaces.

Effect of Median Grain Size on the Properties of Green Sand, by A. B. Draper, Pennsylvania State University, University Park, Pa., and H. A. Knappenberger, North Carolina State University, Raleigh, N. C. Presented by Mr. Draper.

Five sands of constant grain shape and varying fineness were tested for the effect of the median grain size on green compression strength and permeability. The principal influence is on permeability. It also was found that the percentage of southern bentonite addition to attain peak strength varied with the different sands. Maximum permeability values were achieved at different moisture contents than those which produced best compression strength.

A Systematic Approach to Sand Design and Control—Wood Flour, by A. H. Zrimsek, foundry engineer, and G. J. Vingas, research engineer, Magnet Cove Barium Corp., Arlington Heights, Ill. The first three progress reports of this series described thoroughly the function of clay, water content, and mulling on the physical properties of simple clay-sand-water systems.

Other than in nonferrous shops, such simple systems seldom are used in normal foundry practice, but they serve as the basis of comparison for the more complex systems containing such ingredients as wood flour, cereal, seacoal, and silica flour. To understand the function of these additives, it is necessary to first understand the base systems of sand, clay and water.

"Well, this gives the facts to work with. They don't like blowholes in castings"

Using the first three progress reports as the basis of comparison, this report deals with the effect of wood flour as a variable on the physical properties of clay-sand-water systems. The results and observations presented were based on data collected on 42 systems having different combinations of clay per cent, water per cent, wood flour per cent, and mulling time. A total of 230 different sand mixes were studied.

Addition of wood flour does not in reality lower dry compression strength of western bentonite bonded sands. It simply increases the water content required to obtain a given dry compression level. Similarly, green compression strength is not increased perceptibly. Only the water content required to obtain a given green compression strength is increased.

Dry compression strengths of southern bentonite sands, on the other hand, are reduced drastically by wood flour additions. Green shear and dry shear strengths of both western and southern bentonite bonded sands experience a drop with increasing wood flour additions. Low clay content sands are affected more by wood flour additions than are high clay sands.

While simple bentonite-sand-water systems experience drastic change from brittle to plastic with small change in water, the same combinations with wood flour added experience the change over a substantially wider range of water content. Simple fireclay bonded sands exhibit this property, and additions of wood flour did not influence this water range except to shift it to higher water levels.

Difficulty in eliminating wet wood flour clusters through mulling was increased by wood flour additions, and, in general, presence of wood flour retarded mulling action.

A Systematic Approach to Sand Design—Interpretation of Data, by A. H. Zrimsek, foundry engineer, and G. J. Vingas, research engineer, Magnet Cove Barium Corp., Arlington Heights, Ill. This is an analysis of the interaction of the various physical properties of sand mixtures, considering all data presented in previous progress reports.

Conclusions: No one particular

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physical property of sand can adequately describe sand quality.

A study of the relationship of green compression strength and dry compression strength accentuates the importance of mulling, clay type and content, and the influence of wood flour on clays.

The density differential from one to ten rams is related to clay content in simple sand-clay-water formulations when moisture of the sand mixture is beyond that required for minimum density.

The interaction of the physical properties clearly shows that southern and western bentonite react differently with mulling efficiency, mulling time, and wood flour additions.

Wood flour additions to southern bentonite bonded sands reduce the density differential substantially as though less clay was present than actually existed in the mixture. Western bentonite, however, remains unaffected.

The Carbon Dioxide Process, by G. D. Haley, supervising metallurgist, Welding Department, WaiMet Alloys Co., Dearborn, Mich., and James L. Leach, professor of mechanical engineering, University of Illinois, Urbana, Ill.

Purpose of this investigation was to determine the interrelated effect of the major variables in this process, including gassing time, gassing pressure, grain fineness of the sand, and amount of binder. Proposed is a standard method of testing the carbon dioxide hardened sands.

Conclusions arrived at are: 1. Higher strengths are obtained with higher percentages of binder. 2. Rate of increase in strength decreases with higher percentages of binder. 3. More binder requires a greater volume of gas to develop high strengths. 4. Amount of binder required increases as the mesh size of the sand decreases. Coarse sands do not form strong mixtures. Finer sands form harder mixtures if sufficient binder is present.

5. Shorter gassing time requires higher pressures to obtain high strengths. 6. Higher percentages of binder require higher gassing pressures at constant gassing time. 7. For a specific amount of gas, longer gassing times and lower pressures give higher strengths than shorter times and higher pressures. 8. There is a critical amount of gas that will give the maximum strength for each sand mixture. This amount of gas is higher for the finer sands.

Vacuum Melting

● A JOINT SESSION sponsored by the Steel Division and the Fundamental Papers Committee was devoted to a symposium on vacuum melting and casting.

Vacuum Induction Melting and Casting by W. A. Matejka, Kelsey Hayes Co., Utica, N. Y., described equipment and some practices employed in vacuum melting with the induction furnace as well as casting in a vacuum. Production pertained to ingot practice for high-temperature alloys, and it was found that the product possessed better workability, that better composition control was obtained, and physical properties were increased considerably.

Speciality Melting as a Service Function in a Research Laboratory, by W. F. Moore, General Electric Research Laboratory, Schenectady, N. Y. A wide variety of equipment is being employed to provide suitable alloys for research. It includes vacuum induction melting, cold crucible with consumable electrodes in a vacuum or with inert electrodes in an inert atmosphere, an atomic hydrogen furnace using tungsten electrodes in a hydrogen atmosphere, and zone melting.

Choice of the melting process required information derived from phase diagrams, vapor pressure data, thermodynamic data, reactivity, melting point, and raw material.

Quality Requirements of Alloys for Use in Vacuum Induction Melting by T. F. Kaveny, Union Carbide Metals Co. Div., Union Carbide Corp., Cleveland, and presented by R. A. Clark of the same company. Quality can be judged best by gas content, but such elements as phosphorus and sulfur present a problem since they are difficult to remove.

Most satisfactory method of removing oxygen is by a carbon boil. Nitrogen is harder to remove since it must be done by diffusion. Hydrogen is not difficult to remove.

Effect of Sulfur and Carbon on Tensile Properties of Vacuum Cast High-Strength Steel by J. B. Dabney, American Brake Shoe Co., Mahwah, N. J., M. C. Flemings and H. F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass., and presented by Professor Flemings.

Although sulfur can be removed by distillation at very low pressures, best procedure is to use lime imbedded in the bottom of the furnace lining. This provides sulfur contents in the range of 0.004 per cent. With such treatment a modified 4340 alloy gave a tensile strength of 250,000 psi, and a reduction of area of 40 per cent. With higher sulfur content, the alloy showed considerable reduction in properties.

300 Kilowatt Induction Melting and Degassing Installation by O. E. Erickson, Hanford Foundry Co., San Bernardino, Calif. He described an installation using a 3000-lb induction furnace lined down to a capacity of 2000 lb. Furnace is located under a removable steel dome which during operation is sealed to the base of the unit.

Some Theoretical and Practical Considerations in Vacuum Induction Melting Uranium Alloys by P. S. Schaffer, Watertown Arsenal, Watertown, Mass. Based on thermodynamic data a magnesia crucible and zircon sand molds were selected for melting and castings production. The molds were made of zircon sand plus alumina and bonded with phosphoric acid. Practice resulted in a reduction of 47.7 per cent in oxygen, 67.3 per cent in hydrogen, and 35.8 per cent in nitrogen compared with other practices.

Ladle Degassing for Foundry Use by H. S. Philbrick, John Mohr & Sons, Chicago. In co-operation with A. Finkl & Sons Co., Chicago, the firm developed a portable vacuum

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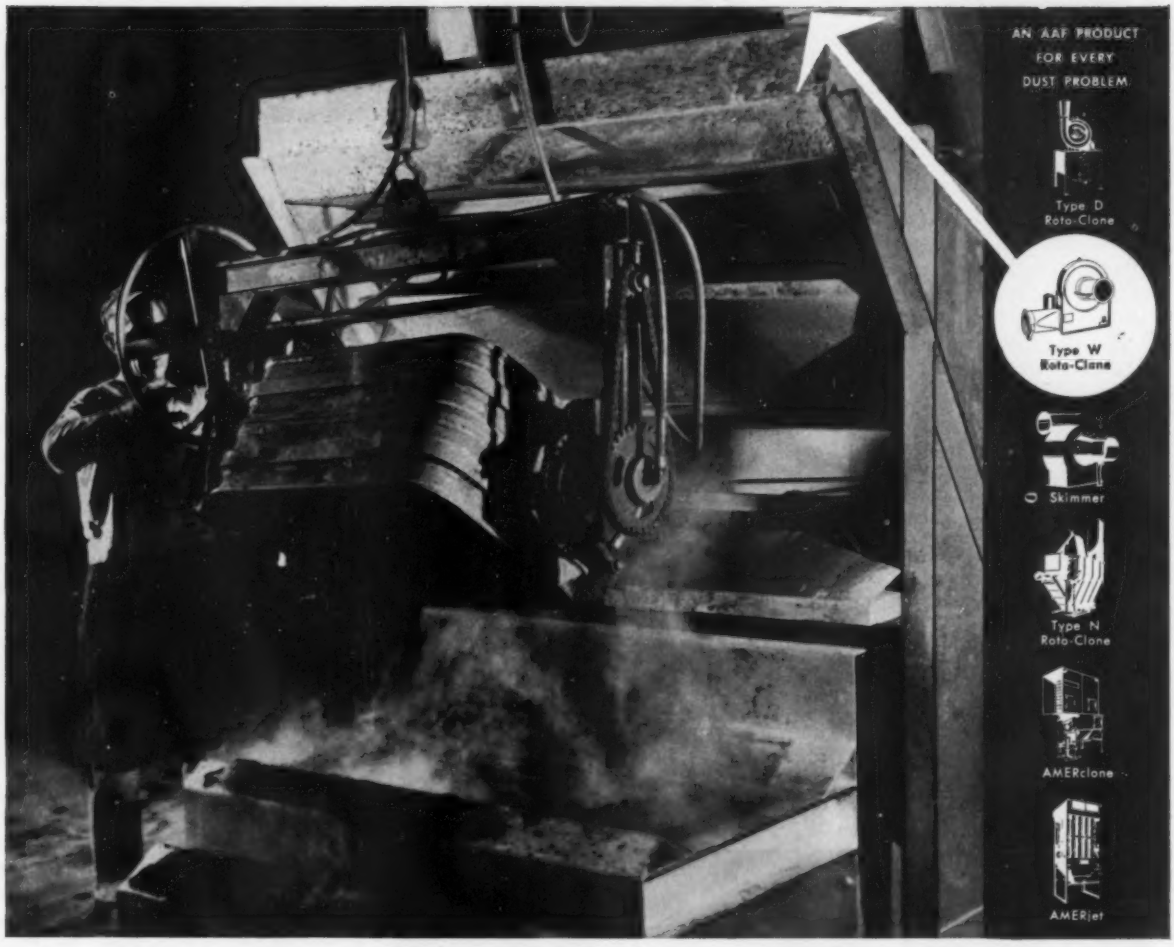

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For More Information Circle 640, Page 39

degassing unit which can be transported on a flat-bed truck. Chamber of the unit will hold a 2½ ton ladle and is designed for transportation to foundries which are interested in investigating the application of vacuum degassing as part or all of its operations.

Fundamental Papers

● TWO technical sessions were devoted to fundamental papers. The first session provided three papers dealing with solidification or freezing of metal and grain refinement, and the second session featured two papers reporting research on the evaluation of fluidity and extraction of heat from external corners of castings.

Structures Produced in Rapidly Solidified Alloys, by P. E. Brown, and C. M. Adams Jr., Massachusetts Institute of Technology, Cambridge, Mass. Theory for the freezing of rapidly solidified castings is based on mass and heat flow considerations. It incorporates information from the phase diagram and other data on properties of alloys and shows that dendrite spacing varies in a linear way with the square root of solidification time and with the inverse temperature gradient.

Experimental results with aluminum, copper, and nickel-base alloys are in complete agreement with the theoretical development. For several aluminum alloys the undercooling in the liquid in the vicinity of thickening dendrites was on the order of 0.1° F, constant over a 16-fold variation in solidification rate. The response of 2014 alloy arc deposits to heat treatment depends on solidification rate and solutionizing time in a predictable way that is consistent with mass transport considerations.

Grain Refinement of Steel Castings and Weld Deposits, by G. K. Turnbull, D. M. Patton, G. W. Form, and J. F. Wallace, Case Institute of Technology, Cleveland. Research demonstrated that selected additions, which include titanium, columbium and titanium carbide, noticeably refine the as-cast grain size of 0.14 per cent carbon steel ingots and the as-deposited structure of steel welds. Strength is increased, although ductility and impact resistance are reduced. Expectation is that heat treatments will be developed to improve ductility.

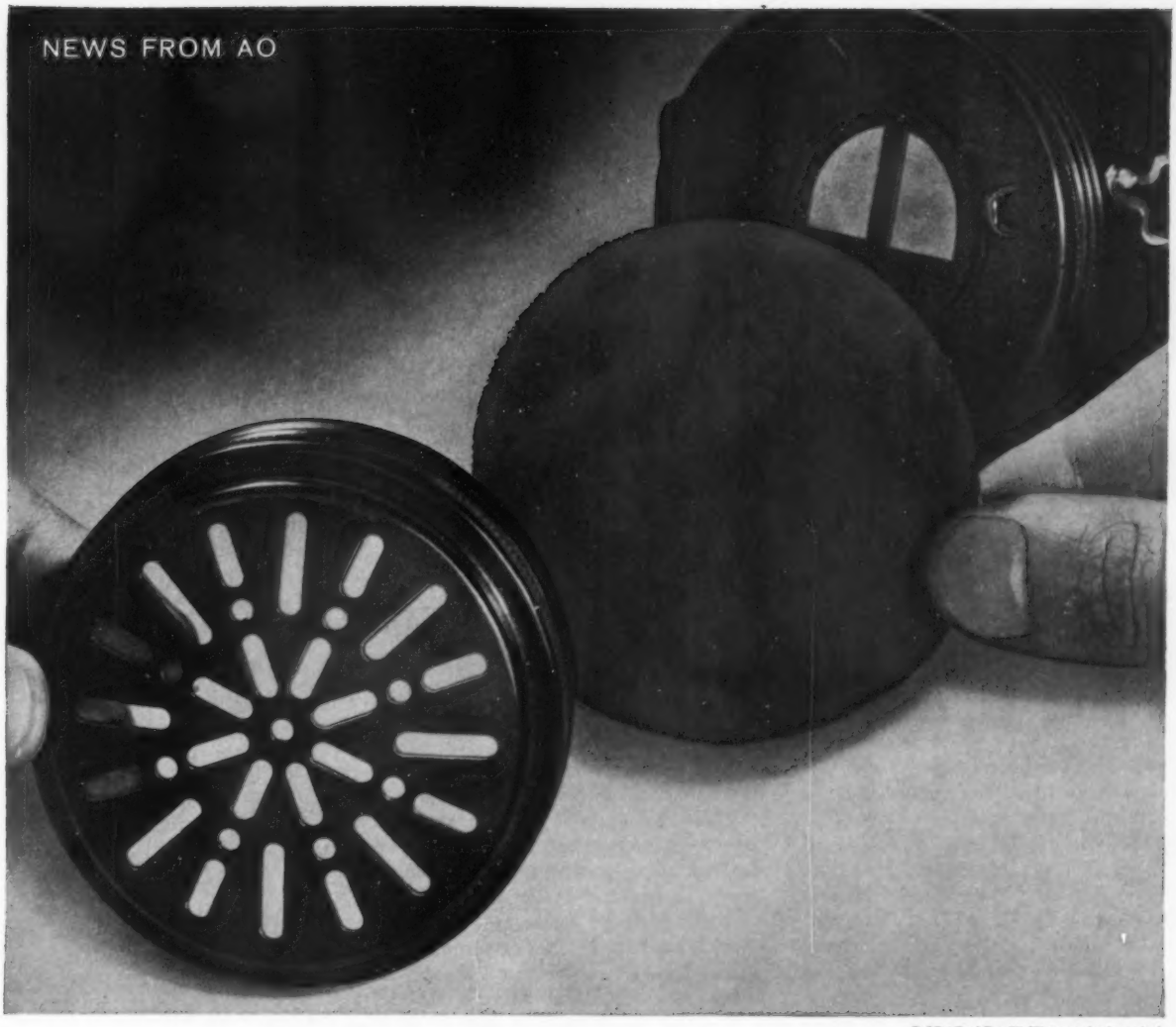
Solidification Studies on Steel Castings and Ingots, by M. C. Flemings and H. F. Taylor, Massachusetts Institute of Technology; R. V. Barone, Walworth Co., Braintree, Mass.; and S. Z. Uram, Hitchiner Corp., Milford, N. H. Solidification of high-strength, low-alloy steel (AISI 4330 and 4340) was studied with main emphasis on examining different methods of obtaining directional solidification and effects of solidification variables on structure, segregation and properties. Flat plates and cylindrical castings weighing about 50 lb were cast with techniques to achieve varying degrees of directional solidification.

Conclusions included the following: 1. Microporosity can be discerned in flat plates by careful microradiography even when solidification takes place under relatively steep thermal gradients. Ductility at high strength levels is markedly affected by presence of the microporosity. 2. Feeding distance is a quantity strongly dependent on degree of soundness required. 3. Microporosity is reduced in plates and cylinders by increasing thermal gradients during solidification. 4. Generally, techniques which result in steep thermal gradients during solidification also result in a fast cooling rate during solidification and as a result refine inclusions and decrease dendrite arm spacing.

5. Steepest thermal gradients measured were in cylinder castings with an arrangement designed to permit essentially unidirectional heat flow during solidification. 6. Microporosity was essentially absent in unidirectionally solidified cylinders except at the topmost portions. 7. Dendrite arm spacing in the unidirectional ingots is inversely proportional to the square root of cooling rate; this spacing increases with increasing distance from the chill.

8. Unidirectionally solidified ingots are remarkably free of macrosegregation. 9. Mechanical properties of unidirectionally solidified cylinders, particularly reduction in area and elongation, were markedly superior to those of cylinders cast

Left to right, discussing a Fundamental Papers session, are William G. Gude, Editor, and Erle F. Ross, FOUNDRY; J. F. Wallace, chairman, and H. D. Merchant, Case Institute of Technology; M. C. Flemings, Massachusetts Institute of Technology, speaker; and W. A. Matejka, Kelsey-Hayes Co., co-chairman



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R-31	Organic vapors
R-32	Acid gases
R-33	Organic vapors and acid gases
R-34	Ammonia
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in sand. 10. The improvement in properties obtained by unidirectional solidification is attributed to reduction of microporosity, improved chemical homogeneity on a micro and macro-scale, and increased freedom from inclusions.

An Experimental and Quantitative Evaluation of the Fluidity of Aluminum Alloys, by M. C. Flemings, E. Niiyama, and H. F. Taylor, Massachusetts Institute of Technology. Presented by Prof. Flemings.

Two aspects of a fluidity research project started about four years ago are covered in this paper: 1. Effects of added elements on fluidity of aluminum alloys. 2. A mathematical analysis which attempts to describe the variables that influence fluidity.

Results indicate that alloying elements in aluminum generally have little or no effect on fluidity.

Oxide film and interface resistance between the mold and metal stream were found to have negligible effect. Surface tension of the alloy did have a slight effect.

The amount of heat that the alloy has to give up before freezing and the rate heat is extracted from the alloy by the mold were the most important factors influencing fluidity.

Heat Extraction from External Corners of Metal Castings, by K. H. Coats, University of Michigan, Ann Arbor, Mich. This was a mathematical endeavor to estimate time of heat extraction from sand molds. No experimental work was done to verify the findings. Mathematical values representing heat extraction rates obtained in solving certain equations can be used with a table provided in the paper to find the solidification time for a casting.

Plant Equipment

● ONE technical session was devoted to plant equipment. K. M. Smith, staff engineer, Caterpillar Tractor Co., Peoria, Ill., discussed **Maintenance Materials Inventory Control and Materials Disbursing Systems.**

A 15-step maintenance material control and disbursing system will reduce costs and improve maintenance. Steps leading to an adequate evaluation of the need for each item was outlined as well as details of crib arrangement and operation. The program shows management how the systems can best service maintenance department needs and also achieve low production costs.

For adequate inventory control it is necessary to determine what parts will be needed, what it costs to keep them in stock, and what it might cost if they are not kept in stock. All equipment must be identified and complete pertinent information about it kept in a file folder. An analysis must be made as to what would happen in case the equipment fails—down time at low, medium, and high production.

If some tools are old and parts cost too much, it may be more economical to discard the tool. From time to time, a good look must be given maintenance parts inventory that hasn't been used in the past year and parts that haven't been needed in the last two or three years. Sometimes unneeded parts can be returned to the vendor for credit.

Steel Castings

● THE LARGEST single program of papers at the 65th AFS Castings Congress, held in San Francisco May 8-12, was presented by the Steel Division, which offered a total of 19 papers at technical sessions plus 2 progress reports at a round-table luncheon. In addition, the division co-sponsored a vacuum melting symposium, with the Fundamental Papers Committee, at which 7 papers were presented.

Subjects covered included various nondestructive testing, steel castings for aircraft, press forging of high-alloy steel castings, high integrity steel castings, procuring GSE missile castings, quality control, metal-mold reactions, ladle refractories, feeding distance of bars in investment molds, macroinclusions, gas atmosphere heat treatment, gas heating techniques for centrifugally cast steel cylinders, high alumina roofs for electric arc furnaces, desulfurization, and the flux-cored CO_2 welding process for steel casting repair.

Use of the Betatron for Radiographic Examination of Heavy Section Castings, by L. Venne, Esco Corp., Portland, Oreg. Presented by A. S. Davis, Esco Corp. A betatron is used at Esco to inspect nuclear engine castings. As 100 per cent inspection work increased in amount and size, the company needed a fast, high-energy radiographic source. The current unit was installed in September, 1957, and is a 22-million-volt model.

Since its installation, the company has produced 1200 nuclear castings, 250 with heavy sections which would have been difficult or impossible to handle otherwise. The betatron is used for inspection, as a source of data for preventive action, and to check repair welds. It can inspect a 10-in. section in 5 minutes at 9 ft. The best operating range is in the 4 to 10-in. section range, with most shots taken at a source distance of 9 ft and rarely at less than 6 ft. Double film always is used. The unit has little scatter and is directional and easy to use. It was installed at a cost of $300,000.

Radiography of Cast Nuclear Components by Means of Kilocurie Cobalt Sources, by Richard Lent, Pacific Southern Foundries Inc., Long Beach, Calif. Highly enriched sources permit radiography of sections up to 12 in. with 2 per cent sensitivity. The company's Cobalt 60 camera with a 1000-curie source takes 175 minutes to radiograph a 10-in. section, but is not as expensive as faster equipment. It does a good job and meets specifications. New sources now available would increase the speed by a factor of 2½. The unit costs about $30,000, without installation, and requires little maintenance.

Use of Direct Reading Spectrograph for Analyzing Castings, by Egon Mang, Esco Corp., Portland, Oreg. Presented by A. S. Davis, Esco Corp. The direct reading spectrograph is faster than the photographic process type and is more reliable. Esco wanted the ability to make a preliminary analysis of met-

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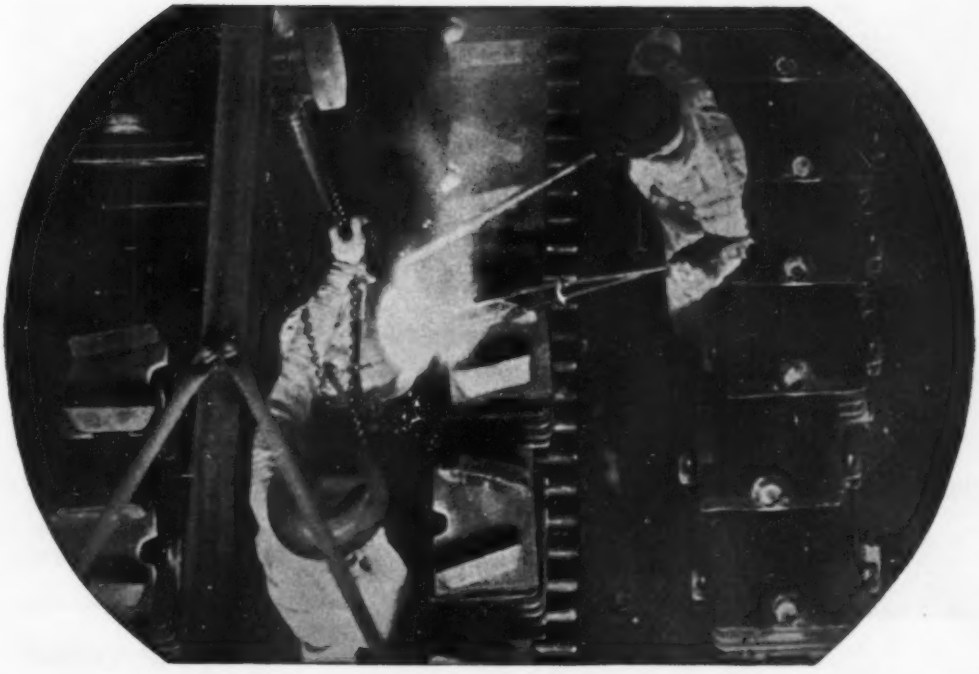

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al, before pouring it, and required speed, accuracy, and capacity to analyze over a range of stainless steels.

The unit compares test pieces with known standard samples, which must be correct. Each instrument is equipped with channels to meet specific needs. The Esco machine has two channels, each able to handle 16 elements. The machine could have six channels, and more are in prospect. The spectrograph is used to make 250 to 350 analyses daily.

Samples tested must be representative and homogeneous. Cast bars, coupons, or slugs are used variously. A fine, columnar grain is desirable since microporosity can cause trouble with an analysis. Analysis takes 10 minutes, including 4 minutes for sample preparation, 2 minutes for analysis, and 4 minutes to convey a sample to the spectrograph. Off-analysis heats can be corrected before metal is poured. The unit saves money by letting the foundry hit for the low end of alloy ranges, but does not analyze for carbon, phosphorus, and sulfur.

Design Problems in Missile Castings, by R. G. Bassett, Boeing Airplane Co., Aero-Space Div., Seattle. The philosophy of missile specifications differs from the specification philosophy for consumer products. The missile maker is bound by strict specifications, some of which are out of date. Available specifications do not describe adequately the quality of parts.

The outstanding reason why missile makers lack enthusiasm for castings is the foundryman's unwillingness to see the point of view of the missile designer. Missile part buyers prefer foundrymen who ask questions, suggest changes, and arrive at an understanding about a cast part before accepting the casting job. The final goal of a missile designer is to achieve reliability.

Challenge or Compromise with Aircraft-Missile Steel Castings, by S. A. McCarthy, McDonnell Aircraft Corp., St. Louis. Aircraft and missile castings require different and more careful processing and handling in a foundry.

Several basic casting design factors were suggested for obtaining good castability characteristics and equal stress distribution. More effort should be devoted to development of stronger alloys so that casting section size can be reduced to minimize weight of cast parts.

Horizon Requirements for Castings, by S. R. Carpenter, Convair Div., General Dynamics Corp., San Diego, Calif. Current applications of castings at Convair were reviewed with the comment that Convair's design philosophy prohibits the use of castings for many applications.

Castings now comprise about 10 per cent by weight of Convair airframe structures; by 1970 they will comprise 5 per cent, according to Mr. Carpenter. He also stated that most defective castings are rejected for shrink cavities.

High Strength Structural Steel Castings for Aerospace Applications, by W. R. Roser, Northrop Corp., Norair Div., Hawthorne, Calif. Reliability is a prime requisite for aerospace parts. Consequently, the quality level of cast parts will have to be raised to meet the necessary reliability standards.

Aerospace vehicle manufacturers in many instances are not able to take advantage of high production economies provided by the casting process. Too few parts are needed for aerospace applications.

Report on the AMC Steel Casting Program to Obtain High Quality, High Strength Steel Castings for Aircraft and Missile Applications, by Y. J. Elizondo, Vought Aeronautics Div., Chance Vought Aircraft, Dallas.

Objective of the program was to exploit advantages of steel castings and to expand the application of the newest foundry techniques to make use of more cast steel aerospace parts. The program involved five phases: 1. Selecting the casting configurations, the processes to be used, and the foundries to be employed. 2. Selecting the alloys. 3. Developing the casting design and setting controls. 4. Trial production runs. 5. Full production run.

The objective of the program was met. Through application of the proper design, many aerospace parts can be made satisfactorily as castings.

"I'd say his phosphorus is running well over 1 per cent"

Press Forging of High Alloy Steel Castings, by T. Watmough, J. T. Berry and P. R. Gouwens, Armour Research Foundation of Illinois Institute of Technology, Chicago. Press forging of 18-8 stainless steel, 17-4 precipitation hardening stainless steel and SAE 4340 steel sand castings under controlled conditions of temperature and deformation results in considerable increases in strength under ideal conditions. The most suitable alloys for the technique are low-carbon, high-alloy types of steel in which the martensite can sustain deformation.

In 18-8 stainless, strength increases of 400-600 per cent in yield strength and 200-250 per cent in ultimate tensile strength were procured by press forging at −100° F with 40 per cent deformation, followed by tempering at 650° F. With the 17-4 steel, 10 per cent increases in both yield and ultimate were obtained by press forging the predominantly martensitic structure 10 per cent at room temperature, followed by aging at 860° F. SAE 4340 is responsive to strengthening by warm working prior to transformation, and at the 240,000 psi strength level the yield point can be increased by 15 per cent and the ultimate tensile strength by 10 per cent. Composition of 4340 is not entirely suited to these techniques.

The process was applied to a specific airframe component and comparisons were made between conventional castings, forgings, and press forged castings produced in 18-8 stainless and 17-4 stainless steel. The most encouraging results in press forging of castings were in the 18-8 stainless, deformed 30 per cent at −100° F.

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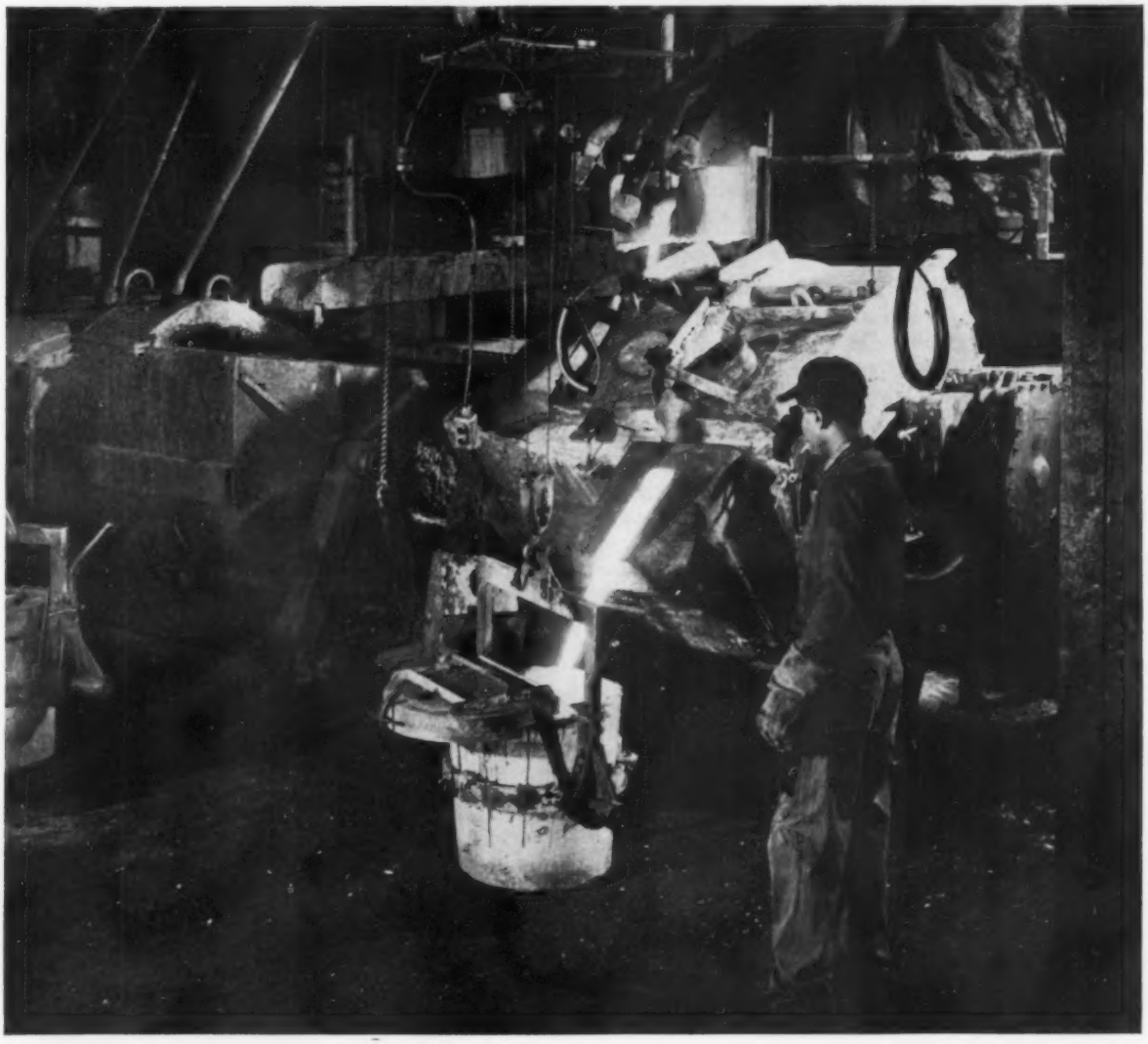

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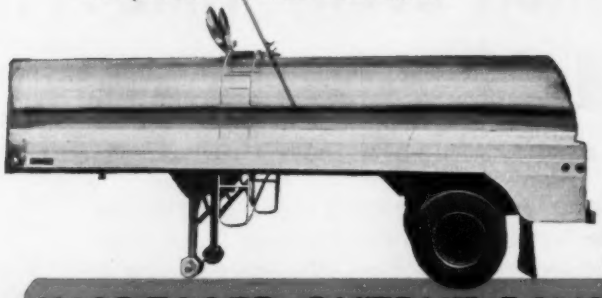

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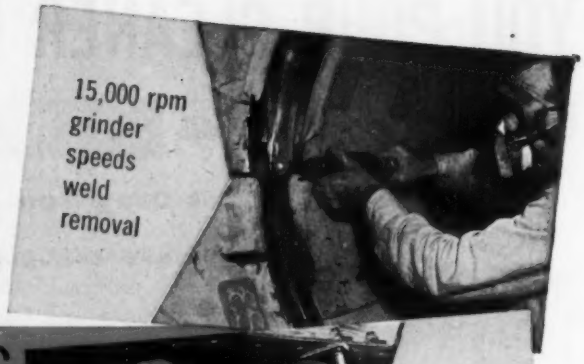

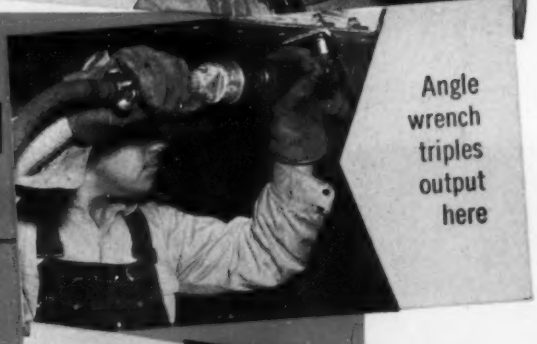

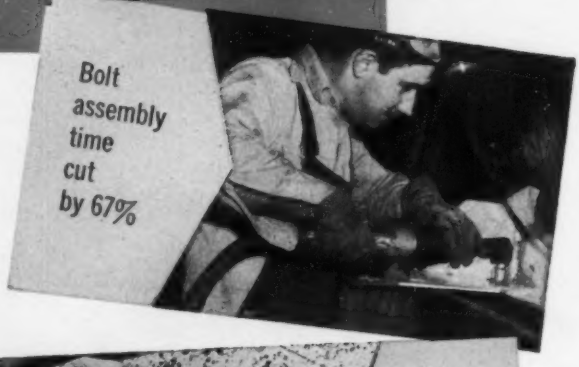

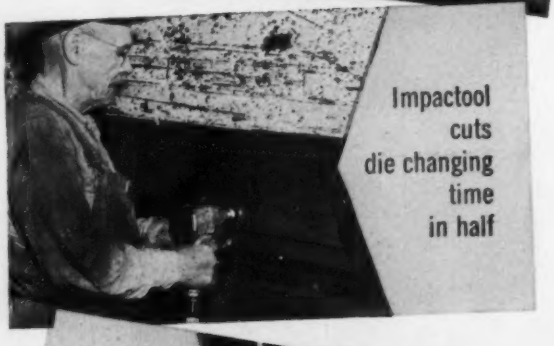

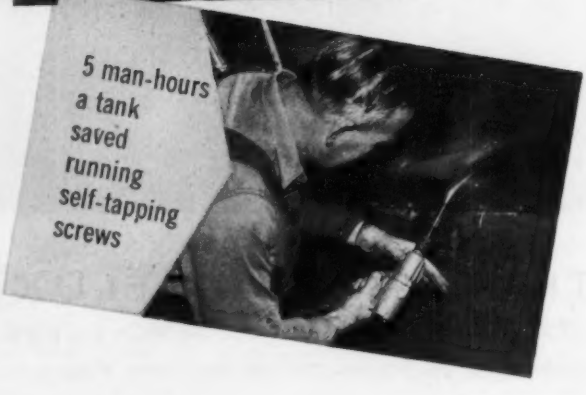

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Planned Annual Retooling increases output per man

the low-carbon, high-alloy steels is feasible, but not without certain difficulties. These involve design of closed dies of adequate strength to press forge at the lower temperatures. Selective press forging of critical areas in castings by semi-open die techniques is perfectly feasible.

Development of Foundry Procedures for High Integrity Steel Castings, by R. J. Ely, assistant chief metallurgist, and J. E. Fries, process metallurgist, Research Center, American Brake Shoe Co., Mahwah, N. J. This paper initially reviews the current status of the physical metallurgy of high-strength cast steel based on several programs sponsored by WADD and reiterates the beneficial effects of high purity charge materials. The second section defines four categories of casting defects and suggests methods for combating these deficiencies. Shrinkage, hot tears, section size effects and surface finish are discussed.

A third section describes the application of these principles to a series of five large missile launcher parts being made to the 180,000 psi level and carrying in addition extremely stringent radiographic, magnetic particle and dye penetrant inspection standards. The final section suggests areas for future work and stresses in particular the need for improved material and radiographic specifications if full advantage is to be taken of the most recent advances in foundry technology. (For more details, see "Achieving Ultra-High Strength in Low Alloy Steel Castings," FOUNDRY, November, 1959, p. 90.)

Procurement of GSE Missile Castings, by L. W. Smith, assistant vice president, Symington Div., Symington Wayne Corp., Depew, N. Y. This paper focuses attention on non-airborne steel castings such as are found in the missile ground support field. The tendency to design and specify airborne quality for ground-type castings needs to be reviewed in light of foundry hardships to meet aircraft quality and the high costs involved in doing so for applications where lower quality standards will suffice.

Factors influencing choice of molding processes and cost of molding are noted. Molding methods include sand, CO_2, shell, ceramic, and investment. General design criteria for non-airborne applications should not be the same as for airborne castings. Use of high-integrity, close-tolerance steel castings, heat treated to a strength level of 180,000 psi or more and requiring little or no machining, is not indicated for ground use applications.

A proposed specification for ground application castings drafted by the Army Rocket and Guided Missile Agency at the Redstone Arsenal is viewed as the direction toward which most steel foundries believe ground support castings should be considered with respect to procurement specifications. An illustration of how cost is affected when Magnaflux and x-ray inspection standards are specified is given. For example, when Class I radiographic examination is specified, an additional 100 per cent is added to casting cost plus the cost of the number of x-ray exposures necessary to cover the casting at $18 each.

Critical areas can be specified for higher quality to control price.

Roundtable Luncheon—Nonmetallic macroinclusions in cast steel occupied the attention of some 80 participants at the Steel Division luncheon. Chairman of the division, D. N. Rosenblatt, American Foundry & Machine Co., Salt Lake City, Utah, presided, assisted by vice chairman W. A. Koppi, International Nickel Co., Inc., New York.

Left to right at a Steel session, A. J. Kiesler, General Electric Co., chairman; G. A. Colligan, United Aircraft Corp., speaker; Hyman Rosenthal, Frankford Arsenal, speaker; L. S. Krueger, Pelton Steel Casting Co., speaker; H. Present, Arwood Corp., speaker; and W. A. Koppi, International Nickel Co.

The Division award for the outstanding steel paper at the 1961 Congress was made to T. Watmough, J. T. Berry, and P. R. Gouwens, Armour Research Foundation of Illinois Institute of Technology, for their contribution "Press Forging of High-Alloy Steel Castings."

Since nonmetallic macroinclusions was the subject of two Steel Division research progress reports, two brief technical papers bearing on certain phases of that topic were presented as a preliminary. The first was "Hydraulics of Gating Systems" by Charles Fendrych, Washington Iron Works, Seattle, Wash., and the second was "Nonmetallic Inclusions in Steel Castings" by William Barber, Esco Corp., Portland, Oreg.

Sources and Prevention of Nonmetallic Macroinclusions in Cast Steel, by R. A. Flinn, W. B. Pierce, and L. H. VanVlack, University of Michigan.

For several years the AFS has sponsored research to determine the causes of large nonmetallic macroinclusions in steel castings. These usually take the form of shallow slag-like masses on cope or vertical surfaces, and usually are about 1 in. in diameter, sometimes up to 3 in., and as deep as ¼ in. These inclusions also have been known as ceroxides and by other more descriptive, less delicate terms.

In previous reports, carried on by

the present work, it has been determined that the most serious type of macroinclusion consists of corundum crystals in a glassy silicate groundmass. Although this material may be formed (1) during deoxidation of the steel, (2) by reaction with ladle refractories, and (3) in the mold itself, reaction (2) is the most serious source.

Present data indicate the inclusions may be eliminated by use of alumina or magnesia refractories, and by a whirl gate trapping system of new design. From tests it is tentatively concluded: 1. The cross gate, flat gate and whirl gate all are superior to the straight gating system. 2. Under highly critical conditions, simulated by the synthetic macroinclusions, the results from the whirl gate appear best. Further field research will be conducted.

Evaluation of Refractories as Sources of Macroinclusions, by L. H. VanVlack, J. E. Brokloff, R. A. Flinn, University of Michigan. Molten metals react with many of the commonly available refractories. The consequences are evident in rapid erosion of refractories and in creation of reaction products which can be sources of casting imperfections.

Purpose of this work has been to provide a simple test to analyze the nature and extent of the reactions between molten steel and foundry refractories.

Previous research has shown that one of the important sources of macroinclusions is from metal-refractory interaction, and this paper is concerned with the details of this interaction. This phase of the investigation evaluates refractories for their stability in the presence of molten steel and studies the relative effects of metal composition, time, and temperature on the molten metal-refractory reactions.

Four principal types of refractories were selected for evaluation: Silica, fireclay, alumina, and magnesia. Although the latter two types are more expensive per pound, it is thought that their greater stability might lead to a lower cost per pound of casting.

Conclusions: 1. Aluminum produces a reaction product on fireclay refractories that is identical with the macroinclusions which cause the casting imperfections. This may temporarily protect the refractory at low temperatures until it is removed by erosion into the metal stream.

2. Manganese accentuates the fluxing reaction at the refractory surface. It does not produce corundum unless aluminum is also added to the steel.

3. Silica and fireclay refractories are subject to severe fluxing reactions at high manganese levels—over 2.75 per cent. Alumina and magnesia refractories are essentially immune to the reactions under the range of the conditions tested.

4. At low manganese levels—less than 0.5 per cent—fireclay refractories are more subject to reaction with molten steel than are silica refractories. At high manganese levels, at 2850° F, the initial attack of the silica is greater.

5. Temperature variation in the range of 2850-2950° F has relatively minor effect on the reactions. There is one exception. The reaction product (conclusion 1) is fluxed more severely at higher temperatures and therefore the refractories are more easily eroded (temperatures in excess of 3000° F for fireclay and silica would alter this conclusion because these refractories could be melted without any reaction).

6. Time of contact has a minor but noticeable effect at low manganese levels. At high manganese levels, reaction is severe even in brief intervals of contact.

Meeting the Challenge of Controlling Quality, by L. S. Krueger, Pelton Steel Casting Co., Milwaukee. Management responsibilities in attempts to improve casting quality include an honest desire to seek improvement, the providing of competent people and proper facilities, the correct application of research data, and 100 per cent support of supervisors.

Pelton's quality control committee consists of the works manager, metallurgist, chief inspector, and general foremen of the foundry and finishing department. It has established improved communication and records and developed follow-up procedures for handling deviations from quality standards. It also conducts a quality control school for the workers. Held on Saturday mornings, the school usually attracts 40 to 50 men (on their own time) and gives an opportunity for discussing and working out problems affecting quality.

A significant improvement in product quality has resulted from the concentrated attention given the subject.

Factors Affecting Metal-Mold Reactions, by G. A. Colligan, United Aircraft Corp., East Hartford, Conn., and L. H. VanVlack and R. A. Flinn, University of Michigan. Presented by Mr. Colligan. To study oxidation occurring at the mold interface, step castings were poured in green sand and shell molds. These two mold materials were selected as representing extremes in amount of oxidizing atmosphere present.

Oxides in the stripped surface of the castings were identified by x-ray diffraction. They were most prevalent with the highest oxidizing atmosphere and with increased manganese content. Selection of a sand binder that will provide the proper mold atmosphere is an important factor in controlling the reaction.

Feeding Distance of Bars in Investment Molds, by H. Present, Arwood Corp., Brooklyn, N. Y., and Hyman Rosenthal, Frankford Arsenal, Philadelphia. Presented by Mr. Rosenthal. This study, relating to round bars, investigated the effect of mold temperature and pouring temperature on the feeding range of investment castings. Diameters of bars tested ranged from ¼ in. to 1 in. Bars were poured vertically and attached to a pouring basin which provided feed metal. Results showed that maximum feeding distance for carbon steel is increased by higher mold and pouring temperatures, also by higher

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carbon content for the same pouring temperature.

Improve Fatigue Life of Steel Castings by Controlled Gas Atmosphere Heat Treatment, by R. D. Block, Barber Coleman Co., Rockford, Ill., explained principally the different types of generators and their operation in producing gas for heat treating furnace atmosphere. These generators include the endothermic or reaction type, exothermic, nitrogen, hydrogen, and dissociated ammonia units.

Rapid Gas Heating Techniques for Centrifugally Cast Steel Cylinders, by A. Ayvazian, Watertown Arsenal, Watertown, Mass. This report relates to 90-mm gun tubes, 17 ft long, made of 4330 steel. Charges are subjected to a furnace temperature well above the final level sought in the pieces. The tubes reach 1735° F after 45 minutes, are cooled at 1500° for 15 minutes, then quenched for two minutes prior to tempering.

The process saves considerable time compared with conventional practice and provides comparable or better properties. Grain size is slightly larger but no significant changes are shown in impact properties.

High Alumina Roofs for Electric Arc Furnaces, by R. E. Gray, Texas Steel Co., Fort Worth, Tex. Higher operating temperatures and oxygen injection are hard on furnace lining and prompted development of refractory practice which has increased roof life and reduced down time and costs. High alumina refractory is used for the roof, which is made up of brick and ramming material, and is employed for both basic and acid furnaces. It incorporates a replaceable center section.

Rapid Desulfurization to 0.002 Per Cent Sulfur, by E. J. Dunn Jr., Crucible Steel Co., Pittsburgh. Presented by Ralph Carlson, American Cast Iron Pipe Co. Although cerium, calcium, and magnesium additions form the most stable sulfides, calcium is most desirable from the standpoints of cost and safety. It is added to the bath in the form of calcium-manganese-silicon in an amount equal to 0.6 per cent of the charge. A metal screen cage lowered by a crane is used for the inoculation, which is performed after lime has been added to the bath.

The furnace then is poured immediately. Cleanliness of the steel is improved considerably.

A Flux-Cored CO_2 Welding Process for Repairing Steel Castings, by M. B. Prisuta, National Cylinder Gas, division of Chemetron Corp., Chicago. This process provides a high deposition rate and permits cost saving through use of relatively inexpensive carbon dioxide as the shielding gas. The electrode, fed through a semiautomatic gun, is available in different types designed for use with a particular grade of steel. (See "CO_2-Shielded Welding," June FOUNDRY.)

SDCE Offers Bound Technical Papers on Diecasting Topics

The Society of Die Casting Engineers is offering for sale a bound collection of technical papers which were presented at the first National Die Casting Exposition and Congress, held in 1960. Thirty papers, with formulas, graphs, and illustrations, are included in the volume.

Broad classifications covered by the papers are die design, die building, metallurgical developments, competition to diecasting, cost and profit, quality control, vacuum applications in diecasting, and future developments. Introductory remarks by technical session moderators at the congress are included.

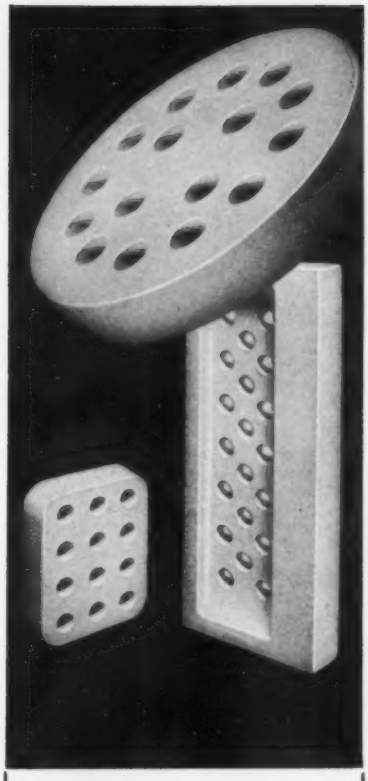
Copies of the volume can be purchased for $10 each from the society, at 19382 James Couzens Highway, Detroit 35, Mich.

Book Review

Giesserei Lexikon **(Foundry Dictionary) edited by A. Schulenburg, leatherette, 952 pages 6 5/8 x 9 7/16 in., published by Fachverlag Schiele & Schoen GmbH, Berlin, Germany. Price 68 DM.**

This second edition, in German, has been revised and extended to cover some 6000 terms relating to the foundry field. The various definitions are amplified by 800 illustrations and diagrams as well as over 150 charts and tables. All terms are listed in alphabetical order.

The book contains a 48-page index of sources for foundry products (castings) and foundry supplies and equipment. In addition, the book includes nearly 100 pages of advertisements.



Louthan strainer cores cut foundry costs

You minimize casting problems, get cleaner castings when you use Louthan *refractory* strainer cores. Now available in more sizes and shapes—and for steel, iron, brass and bronze castings. All provide an accurate choke for positive control of metal flow, eliminate slag and oxide inclusions.

Write for Free Gating and Risering Refractory Folder. Complete file of specifications on all Louthan products.

LOUTHAN

EAST LIVERPOOL, OHIO

A UNIT OF FERRO CORPORATION

Refractories Division

For More Information Circle 648, Page 39

service

Ohio Ferro-Alloys Corporation maintains a foundry service division whose primary assignment is to serve as your consultants on any casting problem, even if it does not pertain to alloying. Their job is to help you make good castings.

The men in this division are qualified both by training and experience to discuss your problem knowingly and helpfully, although like all sensible persons, they will admit they do not know **all** the answers.

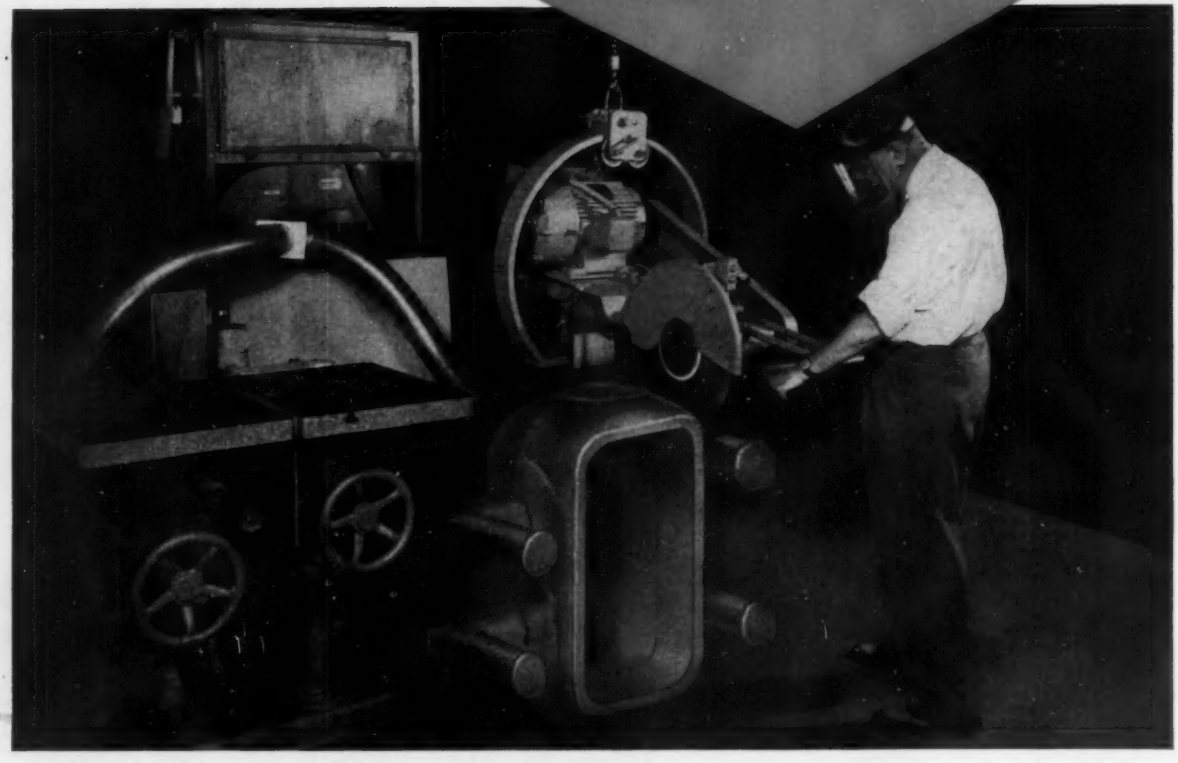
If you have a castings problem of any kind, you'll very probably find it helpful to call on the men in our foundry service division. You'll like their attitude, their approach and their know-how.

For More Information Circle 649, Page 39

QUALITY SERVICE DEPENDABILITY

Ohio Ferro-Alloys Corporation
Canton, Ohio

New Tabor Cut-Off reduces Foundry costs



Tabor-Brasive Double-Duty Cut-Off with new Swing-Frame feature.

Now! Tabor combines a table type Cut-Off with a Swing-Frame to help reduce foundry costs. The new Swing-Frame Feature is available on the 15 H.P. Tabor Cut-Off with 20-inch abrasive cutting wheel.

Any alloy steel, nodular and ductile iron, or conventional foundry metal can be cut easily with the Tabor Swing-Frame. Operation is simple. Just pivot the head inside the ring, or rotate the entire head, and you are ready to cut. With the Tabor Swing-Frame, castings can be cut at any angle.

The Tabor Swing-Frame means there is less equipment to buy, less floor space is required, and maintenance is reduced.

Ask your Tabor Man to show you how the new Tabor Swing-Frame can cut *your* foundry costs. Call him now, or write for information.

TABOR MANUFACTURING CO.
Division of Turbo Machine Company
LANSDALE, PENNSYLVANIA

TABOR
TRADE 1884 MARK

MEN of INDUSTRY

CHARLES YAKER
. . . Misco Precision Casting promotions

AJAX VARTANIAN

RICHARD S. MOYER
. . . mfg. director

MARK M. MILLER
. . . joins Texas Foundries

DONALD F. KITTREDGE
. . . assistant v. p.

Charles Yaker has been named vice president-manufacturing at Misco Precision Casting Co.'s plants in Whitehall and Muskegon, Mich. **Ajax Vartanian**, formerly superintendent, has been made manager at Muskegon. Mr. Yaker has served as manager of both plants.

R. E. Wells has been elected president, Chicago Foundry Co., Chicago, succeeding **R. I. Wells**, who remains active as board chairman. **Charles E. Fausel** has been made vice president - operations and **Thomas W. Scanlan** treasurer.

Robert F. Treuer, president of Atlas Brass Foundry, Los Angeles, has been named general manager of western operations, Bunting Brass & Bronze Co., Toledo, Ohio.

Marius G. Guyot, since 1945 chief mold designer, Aluminum Co. of America, Cleveland, has retired after 41 years with the company. A native of Paris, he joined Alcoa in 1920, and was a pioneer in development of the permanent mold casting process.

Albert J. Booth has been named general manager of the Chicago plant, Stewart Die Casting Div., Stewart-Warner Corp. He joined the division in 1959 as head of its Bridgeport, Conn., plant.

F. S. Wellman, former board chairman, Wellman Bronze & Aluminum Corp., Bay City, Mich., has been elected honorary board chairman and director emeritus for life. **Robert Allport** was named treasurer and **L. H. Manning** assistant treasurer. **Richard Allchin**, president, Rotor Tool Co., Cleveland, and **R. C. Wellman** were named directors.

Mark M. Miller has been named general sales manager in charge of domestic and international sales and a member of the executive committee, Texas Foundries Inc., Lufkin, Tex. He was vice president-sales, Industrial Div., National Malleable & Steel Castings Co., Cleveland.

Myron D. Stepath, president, Arcair Co., Lancaster, Ohio, received the Samuel Wylie Miller Memorial Medal of the American Welding Society, New York, at its recent annual meeting, for meritorious achievement in the welding field.

Thomas Welfer has been named secretary, Harbison-Walker Refractories Co., Pittsburgh, succeeding **G. F. Cronmiller Jr.**, who has retired as vice president and secretary after 48 years of service. Mr. Welfer joined the company in 1942.

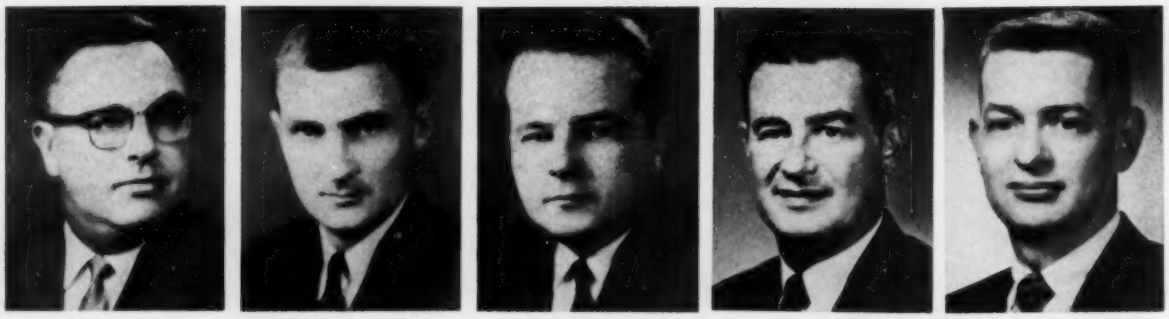
Mrs. Evelyn C. Heinzelman has become chairman of the board of directors, Palmyra Basic Foundry Inc., Palmyra, Wis. **James Alex**, formerly president, Mueller Industries Inc., South Milwaukee, Wis., succeeds Mrs. Heinzelman as president.

Donald F. Kittredge has been named assistant vice president in the International Div., National Malleable & Steel Castings Co., Cleveland. He was sales manager of the company's Transportation Products Div., New York.

Richard S. Moyer has been named director of manufacturing, Link-Belt Co., Chicago, succeeding **Harold L. Hoefman**, who has retired as vice president for manufacturing after 41 years with the company. Activities in South Africa and Australia, formerly handled by Mr. Hoefman, have been transferred to the new International Div. Since 1959 Mr. Moyer was assistant to the vice president in Indianapolis at the Ewart plant.

Guy J. Coffey has been elected board chairman and chief executive officer, Chicago Pneumatic Tool Co., New York, succeeding **H. Arnold Jackson**, who continues as a director and executive committee chairman. **Norman Readman**, formerly managing director of overseas operations, becomes president, Mr. Coffey's former position. **Thomas F. Noonan**, becomes vice president in addition to his duties as comptroller. **Carra L. Lane** has been made vice president and manager of plant operations.

Alexander P. Raeburn, a director, has been named secretary-treasurer, American Refractories & Crucible Corp., North Haven, Conn. **Charles H. Pierce** has been appointed sales



STANLEY V. LUCAS CHARLES W. HAAS T. D. BROWN
. . . pig iron sales representative appointees

CLARENCE C. HANSON JAMES K. McLAUGHLIN
. . . Ajax Magnethermic executives

director, and **Denys R. Rosling** will head the new engineering-service department.

T. D. Brown has been named western representative to handle pig iron sales for American Steel & Wire Div., U. S. Steel Corp., Cleveland, in Iowa, lower Wisconsin, and upper Illinois. **Stanley V. Lucas** succeeds him in northwestern Ohio, Michigan, and Indiana, and **Charles W. Haas** takes over the eastern part of southern New York, Maryland, Virginia, New England, the eastern half of Pennsylvania, both as pig iron sales representatives.

W. L. Schoonover has been appointed representative for Despatch Oven Co., Minneapolis, to cover Georgia, South Carolina, and eastern Tennessee, with headquarters in Atlanta.

Harry G. Brustlin, formerly manager of marketing services, has become general sales manager, Abrasive Div., Norton Co., Worcester, Mass., succeeding **Robert Cushman**, now vice president-general manager. **John U. Calder** becomes assistant to the general sales manager of the division. **Everett L. Sinclair** has been made manager of product engineering, grinding wheels.

Anthony L. Ascik, operations manager of the Alloy & Metals Div., Tennessee Products & Chemical Corp., Nashville, Tenn., subsidiary of Merritt-Chapman & Scott Corp., has been elected vice president in charge of alloy and metal operations.

A. F. Chouinard, director of research and development, National Cylinder Gas Div., Chemetron Corp., Chicago, has been elected president of the American Welding Society, New York.

Lt. Col. S. C. Guillan, T. D. has retired as secretary of the Institute of Metals, London, after 50 years of service. **R. E. Moore**, since 1947 assistant secretary, is the new secretary.

John H. Cassidy has joined the Metals Processing Div., Curtiss-Wright Corp., Buffalo, N. Y., as foundry sales manager. For the last 23 years he was with Allegheny Ludlum Steel Corp., Buffalo, N. Y., as stainless steel castings service engineer.

Clarence C. Hanson, formerly vice president-sales, Ajax Magnethermic Corp., Youngstown, Ohio, has become vice president and general manager of the Trenton, N. J., Div. He will be in charge of the company's Induction Melting Equipment Div. **James K. McLaughlin** has been appointed vice president of the Youngstown Div. Mr. McLaughlin was assistant division manager.

Otis J. Adams has been named chief engineer of the Bartlett-Snow Div., Bartlett-Snow-Pacific, Cleveland, newly formed by the purchase of C. O. Bartlett & Snow Co. by Pacific Foundry & Metallurgy Co., San Francisco. He joined C. O. Bartlett & Snow Co. in 1956 as assistant chief engineer. Mr. Adams will have headquarters at the Cleveland plant.

Frank C. Guise, manager of accessory sales, has become industrial sales manager, Picker X-Ray Corp., New York. He joined the company in 1954.

Frank A. Speer, formerly manager of Crane Co.'s New Castle, Pa., plant, has been appointed vice presi-

W. L. SCHOONOVER
. . . Despatch Oven sales

HARRY G. BRUSTLIN
. . . general sales mgr.

JOHN H. CASSIDY
. . . foundry sales mgr.

OTIS J. ADAMS
. . . chief engineer

FRANK A. SPEER
. . . Mueller Co. v. p.

3 good reasons why foundry applications depend on quality HOEGANAES products

Reason No. 1

is **HOEGANAES ANCOR FLAME POWDER**

. . . which speeds torch cutting and scarfing of oxidation resistant materials, stainless steels, and even heavy gray iron castings.

Reason No. 2

is the new **HOEGANAES GRADE "A" BRIQUETTES for melting stock**

. . . which are of improved high density and purity. For use in induction and arc furnaces, producing corrosion resistant steel alloys.

Reason No. 3

is **HOEGANAES MELTIRON SHOT for melting stock**

. . . and soon to be introduced on the market. A melting stock low in phosphorous, sulphur and cobalt. HSIC Meltiron has been proven commercially in test quantities to produce high grade stainless and high alloy steels.

Your inquiry on these HSIC products will bring prompt response with literature and product data. Or perhaps you would like the services of a field engineering representative. He's at your service.

HSIC

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RIVERTON, NEW JERSEY

SALES REPRESENTATIVES IN PRINCIPAL CITIES: Birmingham, Chicago, Cincinnati, Cleveland (Fostoria), Edmonton (Alberta, Canada), Montreal (Canada), Toronto (Canada), Los Angeles, Mexico 16, D. F. (Mexico), Minneapolis, New England (Elmira, N. Y.), Odessa (Texas), Philadelphia (Riverton, N. J.), Pittsburgh, San Francisco, St. Louis

ROLAND G. BECKER
. . . assistant sales mgr.

VERNON B. JENSEN
. . . becomes district mgr.

ROGER J. BROWN
. . . district mgr., Buffalo

GEORGE J. PEER
. . . general sales mgr.

RALPH W. FERGUSON
. . . becomes district mgr.

dent-works manager, Mueller Co., Decatur, Ill. Previously he was with Bucyrus Erie Corp., Erie, Pa.

Roland G. Becker, since 1958 manager of sales engineering, Bay State Abrasive Products Co., Westboro, Mass., has been named assistant sales manager of the company. He joined Bay State in 1951.

Vernon B. Jensen has been named district manager, Cleveland Tramrail & Steelweld Machinery Divs., Cleveland Crane & Engineering Co., Wickliffe, Ohio, in Cleveland, Toledo, Ohio, and Detroit. He was with the distributor for the company's cranes and monorail systems in San Francisco.

Ralph T. Enriquez, owner, Aluminum Products, Los Angeles, was recently named a director of the 48th District Agricultural Association, by Gov. Edmund G. Brown of California.

R. Kirk Booker has been appointed sales representative in the Houston office, Fuller Co., Catasauqua, Pa. Previously he was with Fisher Body Div., General Motors Corp., Kansas City, Mo.

Roger J. Brown has been appointed district manager at the new Buffalo office and warehouse of Frederic B. Stevens Inc., Detroit. He had been a metal finishing sales representative for the company since 1956.

George J. Peer has been named general sales manager, Basic Inc., Cleveland. With Basic since 1954, recently he was sales manager for the furnace products division.

Ronald W. Thompson has been elected chairman of the board, Interlake Iron Corp., succeeding **Gen. William M. Hoge,** who has retired. **T. F. Bell,** recently executive vice president, has become president, a position which Mr. Thompson had held since 1951.

William I. Moore has been appointed sales engineer, the Beryllium Corp., Reading, Pa. He was general sales manager, Jacuzzi Universal Ltd., Toronto, Canada, and had also engaged in sales engineering at its Richmond, Calif. division.

Jack Parmenter has been named technical sales representative, Foseco, Inc., to cover greater Chicago, central and southern Illinois, and southeastern Iowa.

Ralph W. Ferguson has been made midwest district manager, Newaygo Engineering Co., Newaygo, Mich. He joined Newaygo in 1943 and recently was in the eastern and northern Michigan sales area.

John Hobbis has been named Cleveland Div. manager, Cleco Air Tools, Houston. **Walter S. Spott** is salesman senior in Newark, N. J. **E. T. Peacock** has been named assistant to the Chicago sales division manager. **Henry Tabbiner** has joined Cleco Pneumatic Tool Co. of Canada Ltd., as salesman in Toronto, Ont.

Robert E. Hater, formerly in charge of OEM sales for Aluminum Industries, Cincinnati, has joined Willard Bronze Co., there, as sales manager. The latter company also operates a plant at Graham, N. C.

Robert S. Moore has been named sales representative in Ohio, Pennsylvania, and New York for Chas. Taylor Sons Co., Cincinnati, division of National Lead Co., New

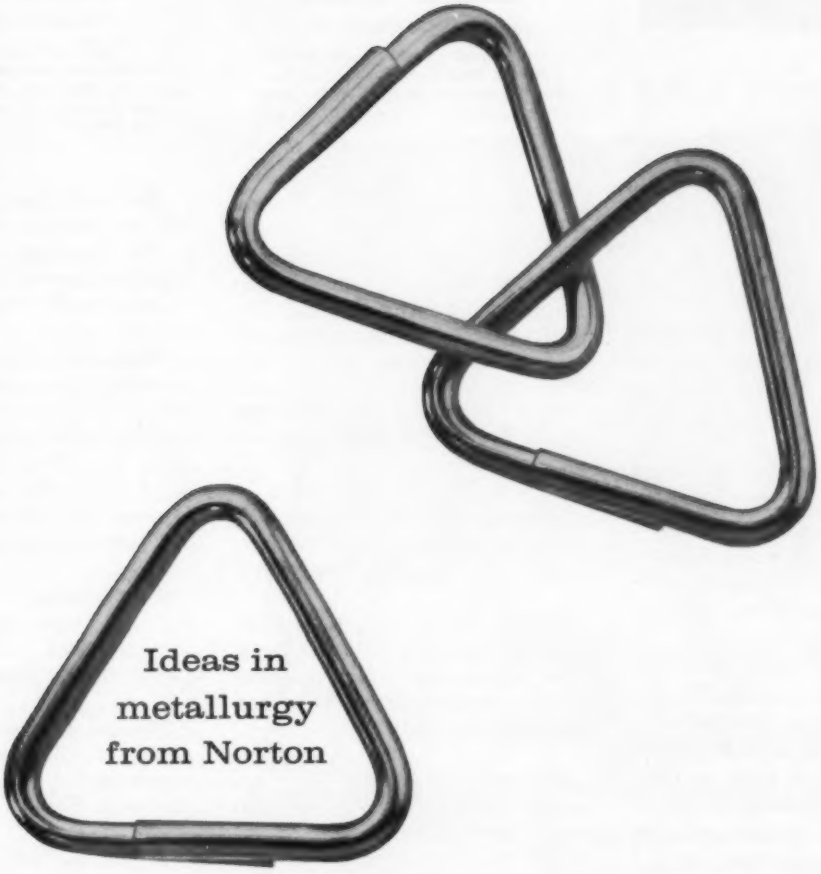
R. KIRK BOOKER
. . . Fuller sales, Houston

WILLIAM I. MOORE
. . . joins Beryllium

JACK PARMENTER
. . . joins Foseco Inc.

ROBERT E. HATER
. . . Willard sales mgr.

ROBERT S. MOORE
. . . refractories sales



Metals are *born* in refractories. And most new ideas in metallurgy call for a new idea in refractory science . . . because a metal can be only as good as the refractory which contains it. Norton makes the finest.

The crucible of the reduction bomb, where uranium and plutonium burst into being, is a Norton product, pure magnesium oxide.

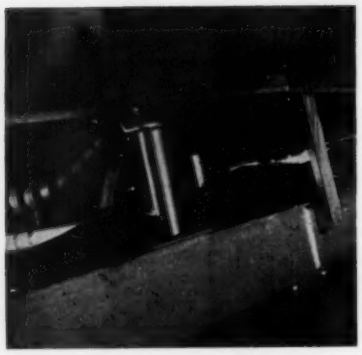
Another Norton material, fused stabilized zirconia, makes possible electric furnacing for processing tungsten and molybdenum, at temperatures up to 2200°C. Zirconia also lines huge pebble heaters and air furnaces in which metals for missiles are tested.

More super-alloys for missiles, submarines and space vehicles are possible through new vacuum melting techniques with high purity fused magnesia made by Norton. And in the aluminum industry, new efficiencies are being achieved with reduction cell linings of silicon carbide and cathode bars of titanium diboride.

In metallurgy as in other fields, Norton is crystallizing ideas into products to solve many problems . . . through oxide fusion and in probing experiments in carbides, nitrides and borides. Norton is ready to work with you in engineering materials to meet your needs. Write NORTON COMPANY, Refractories Division, 306 New Bond St., Worcester, Mass.

NORTON
REFRACTORIES
Crystallizing ideas into products

For More Information Circle 652, Page 39



JOY Limberoller® idlers outlast steel idlers ten to one in foundry operations

Conventional steel idlers have four bearings under the belt where they can clog up with foundry sand and "freeze," eventually causing ripped belts. Joy Limberoller belt conveyor idlers have just two bearings, one at either end, supporting a neoprene-covered steel wire cable. Neoprene discs are molded to the cable, and the swedged shank ends of the cable fit into bearings. The entire unit revolves on its own axis in these end-mounted bearings.

Spilled foundry sand can't possibly get into the bearings because they are up out of the dirt. The bearings may be of the permanently lubricated type so that inspection and greasing are eliminated entirely. Many foundries that have standardized on Joy Limberollers have removed them from their maintenance records. You can make a trial installation simply by putting Limberollers on your present conveyors . . . conversion is quick and easy. Get the complete story by writing for bulletin 2746-13.

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

For More Information Circle 653, Page 39

JOHN F. TORLEY

. . . elected president and general manager, Dayton Malleable Iron Co., Dayton, Ohio, as reported in the June issue.

ROBERT A. GORDON

. . . appointed assistant manager of district sales, Link-Belt Co., Chicago. In the May issue Mr. Gordon's title was incorrectly reported in the item and caption

York, with headquarters in Salem, Ohio.

John F. Thurston, vice president for special projects, General Dynamics Corp., Chicago, has become a senior vice president of the company, and president of its Liquid Carbonic Div. **Rex L. Nicholson,** former division president, has resigned.

Ernest Currie, sales engineer, has been named Chicago sales manager, Precision Castings Co., Cleveland.

George Fostel Jr., Bergenfield, N. J., has joined Foseco Inc., Berea, Ohio, as technical sales representative in southern New York and northern New Jersey.

William Driscoll has been appointed sales engineer for infrared-spectrochemical instruments, Baird-Atomic Inc., Cambridge, Mass. His headquarters will be in Chicago.

T. H. Townsend Jr., since 1956 sales manager, Pure Carbonic Co., New York, has been appointed central regional manager, with headquarters in Cleveland.

W. Neel Robertson, formerly with Holcroft & Co., Detroit, has joined Hauck Mfg. Co., Brooklyn, N. Y., as sales manager of its engineering division.

Harold E. Metcalfe has joined Loftus Engineering Corp., Pittsburgh, as sales engineer. He has been in the industrial furnace field for 20 years.

Thomas D. Hess has joined Basic Inc. as assistant district manager of the Cleveland district. He was with Youngstown Sheet & Tube Co., in Indiana Harbor, Ind.

William D. Messer, formerly sales manager, Construction Div., Huck Mfg. Co., Detroit, has been named general sales manager, Leschen Wire Rope Div., H. K. Porter Co., St. Louis. He succeeds **R. Rex Hartup,** now technical manager of prestressed materials.

R. S. Schuba, formerly Louisville, Ky., sales manager, Hewitt-Robins Inc., Stamford, Conn., has become Detroit district manager.

Howard H. Bundy II has been appointed Cleveland district sales representative for Allis-Chalmers Industries Group, Milwaukee.

Samuel G. Richardson, Cleveland district manager of engineering reports, the Austin Co., Cleveland, has been appointed general manager of the new Austin-Anderson (Australia) Pty. Ltd., owned jointly by Austin and A. J. Anderson Pty. Ltd., North Sydney, Australia.

Marjorie R. Hyslop has been appointed manager of documentation service for American Society for Metals, Novelty, Ohio. She becomes manager of the society's electronic literature searching service following eight years as managing editor of Metal Progress, and 17 years as editor of Review of Metal Literature, technical magazines of the society.

OBITUARY

Raymond L. Collier, 59, former trade association executive, died June 5, in Cleveland. Mr. Collier was executive vice president of the Gray Iron Founders' Society for four years, and previously served with Steel Founders' Society of America for 18 years, during which time he was assistant to the managing director, managing director, and secretary-treasurer. Recently he was finance and public relations director of the Cleveland Area Church Federation.

Vernon S. Spears, blast cleaning specialist for Wheelabrator Corp., Mishawaka, Ind., died May 24. He was a member of the company's sales department for over 25 years. Mr. Spears was a former chairman of the Michiana Chapter of the American Foundrymen's Society.

Charles J. Nock, 62, owner of Nock & Son Co., Cleveland, refractory products, died June 6, in Berea, Ohio. Until 1947, when he organized his own company, he was with Nock Fire Brick Co., Cleveland, founded by his father, the late Charles J. Nock.

Sherwood F. Prescott, 54, grinding wheel sales representative for Norton Co., Worcester, Mass, died May 19. He served 32 years with the company, the last 24 in Cincinnati.

Mrs. Margaret J. Donald, 64, owner of Newton Brass Foundry & Pattern Works, Barberton, Ohio, died May 13.

Oscar W. Josephson, for over 50 years with S. Obermayer Co., Chicago, died May 6. He was sales representative in Iowa and northern Illinois.

Edward H. McGraw, eastern district sales manager, Chain & Electrode Divs., the McKay Co., Pittsburgh, died April 18. He joined the company in 1936.

Edmund A. Sords, 72, former director and personnel manager, Allyne-Ryan Foundry Co., died June 4. When he retired in 1956 he had been with the company 35 years. His father, the late James F. Sords, was one of the company founders.

Boston College Offers Course In Industrial Spectrography

An intensive course in modern industrial spectrography is being offered by Boston College, Chestnut Hill, Mass., July 17-28. It is designed to provide training of personnel from industries in the process of installing spectrographic equipment in their plants.

Admission is limited to approximately 40. A single fee of $200 covers all tuition costs.

Letters of application should contain the applicant's name and age, present employment, indication of academic training, and particular field of spectrographic interest. They should be sent to Rev. James J. Devlin S. J., Dept. of Physics, Boston College, Chestnut Hill 67, Mass.

ATTENTION ALL GRAY IRON FOUNDRIES . . .

Now! HOT METAL
For Pouring Light and Difficult Castings Available in the . . .
NEW U. S. "SKLENAR"
REVERBERATORY
MELTING FURNACE

LOOK AT THE RECORD

Here's authentic performance data on 500 lb., 1000 lb., and 2000 lb. U. S. "Sklenar" Furnaces equipped with straight gas, oil, or dual fuel burners (no addition of fuel oil necessary when firing with gas), all three furnaces melting gray iron to high temperature for pouring light and difficult castings, with full charges consisting of one half pig iron, with balance in gates, risers and ordinary purchased scrap.

MELTING DATA

500 LB.	1000 LB.	2000 LB.
Time: 30 min.	Time: 40 min.	Time: 45 min.
Oil Used: 11½ gals.	Oil Used: 19 gals.	Oil Used: 40 gals.
*Gas Used: 1400 cu. ft.	*Gas Used: 2800 cu. ft.	*Gas Used: 5250 cu. ft.

*1030 BTU

Really hot metal . . .

of sufficient temperatures to pour light and difficult castings of excellent structure and machinability, with practically no rejects—that's the money-saving story behind the performance record of the revolutionary new U. S. "Sklenar" Reverberatory Melting Furnace. Innovations in combustion, design and construction, with patented features that contribute to faster melting, built-in economy of operation, and lower maintenance costs, are all yours in tomorrow's method of melting metals today!

Available in sizes ranging from 500 to 2000 lbs.—iron, brass and bronze (⅓rd these capacities for aluminum melting).

Get free bulletin. Send today for valuable and informative brochure.

For over 40 years builders of the well-known and favorably regarded U. S. Rotary Melting Furnaces.

U. S. SMELTING FURNACE CO.

plastic mold and core duplications save time and labor

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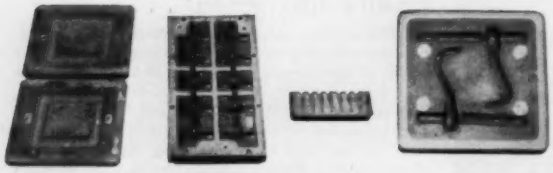
Performance-proven in numerous foundry pattern applications, REN epoxy resins provide an economical answer to rising labor-material costs. The extreme workability of these dimensionally stable materials completely eliminates many costly standard duplication methods.

REN epoxy resin patterns are highly resistant to impact, chemicals and abrasion. They facilitate quick and easy release from sand—without the aid of lubricants. Exacting duplications—surfaces are smooth and free of voids and pits. Applications prove the production life of REN materials practically equals that of iron and aluminum.

At no obligation, send today for your subscription to REN'S bi-monthly publication, Tech-Ni-Tips/Digest.

4 PLASTIC PATTERN APPLICATIONS



A few of more than twenty patterns, duplicated from plaster casts by Wolverine Brass Works, Grand Rapids, Michigan, using REN plastic compounds. Comparison analysis proved Wolverine saved up to 66% in construction time—and up to 80% in labor using REN epoxy resins for these patterns.

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lansing 9. michigan

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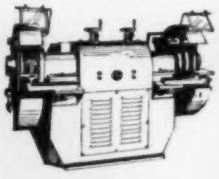
Swing Frame Grinder

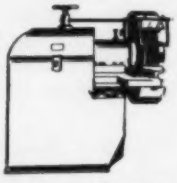
Portable ⅛ to 7½ hp

America's Greatest and Most Complete Line



Dual Motor Vari-Speed Grinder

Write for catalogs and new bulletins



Vari-Speed Single End Grinder

General Purpose Grinder

The United States Electrical Tool Co.

3640 LLEWELLYN ST., CINCINNATI 23, OHIO

For More Information Circle 663, Page 39

BOTTOM BOARDS

MAGNESIUM

OR

ALUMINUM

We can supply any requirement. • Nearly 100 of our own patterns . . . or we'll use yours • Prompt Delivery • Phone or write for sizes and prices . . . *and get our bid last!*

MAG-ALCO Foundry

1640 N. Telegraph Rd., Pontiac, Michigan

FE: 4-8592

For More Information Circle 664, Page 39

For More Information Circle 662, Page 39

TREMENDOUS CORNER STRENGTH

that's one of the secrets behind the popularity of FREMONT'S

SPREADLOCK FLASKS

Another secret of their popularity is the fact that they are made of magnesium. This makes them strong, yet light: Cams, however, are hardened steel forgings; they can stand a lot of banging around without damage. Write today for descriptions and prices.

FREMONT FLASK CO.

FREMONT
OHIO

For More Information Circle 660, Page 39

You get MORE with

MOROC®

the controlled silicate CO_2 binder

MORE SPEED. Curing time ranges from ten seconds to three minutes, depending on type of mold or core.

MORE LABOR SAVING. Cores are ready for use when they come from core box. You eliminate movement to and from ovens, handling of core driers, cementing of halves.

MORE FLEXIBILITY. Fast curing means faster handling of rush orders. There's no need to stockpile cores for future orders. You have the flexibility to meet customer needs on schedule.

MORE PROFIT. With MOROC you can get this extra capacity and flexibility with a smaller investment in equipment than would be required for additional ovens or shell-molding equipment.

MOROC COMES IN FOUR GRADES

MOROC 1. High-strength binder.

MOROC 2. High-strength and good collapsibility.

MOROC 3. High-strength and high collapsibility to meet demands of core-blowing equipment.

MOROC 4. Extra-high collapsibility and good flowability.

Other Diamond Chemicals for the foundry:
Soda Ash (briquettes & granulars) Caustic Soda, Chlorine, Solvents

Write for complete information. Diamond Alkali Company, 300 Union Commerce Building, Cleveland 14, Ohio.

Diamond® Chemicals

For More Information Circle 661, Page 39

GLUTRIN
LIQUID BINDER

GOULAC
DRY BINDER

For

CORE WORK, SAND FACINGS, SPRAYS

Write for pamphlets giving detailed information. Both materials carried in stock by America's foremost foundry jobbers

ROBESON PROCESS COMPANY

(Established 1905)

GENERAL OFFICES: P. O. BOX 960, ERIE, PA. • PLANT: JOHNSONBURG, PA.

For More Information Circle 656, Page 39

EMPIRE*

"THAT GOOD" FOUNDRY COKE

DEBARDELEBEN COAL CORPORATION

2201 First Ave., North • Birmingham 3, Ala.

Phone: ALpine 1-9135

*Reg. U. S. Pat. Off.

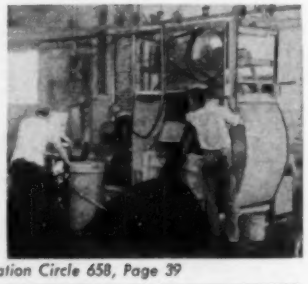
For More Information Circle 657, Page 39

Why wait for better sand!

You don't need expensive extra equipment with the

NEW RINGMULLOR

It's a completely self-contained, portable sand plant that has everything: gyrating screening, batching, mulling, aeration, and optional cooling and magnetic separation. So compact you can now prepare the very best mulled and aerated sand at point-of-use . . . at comparatively low cost. Performance proved in actual foundry operation. Write for complete details.



STATES ENGINEERING CORPORATION

245 E. Murray St.

Fort Wayne, Ind.

For More Information Circle 658, Page 39

THE PROFITABLE ANSWER . . . . . to rising costs is an effective method and production engineering program

Our professional foundry engineering staff is successfully helping management to increase productivity—increase wages —reduce costs.

We are proud of the results obtained for our foundry clients.

Discussing our services involves no obligation or expense.

Information and references available upon request.

D. C. LATELLA & ASSOCIATES, INC. Consulting Engineers

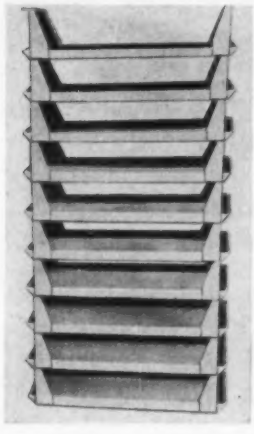
624 WIDENER BLDG., PHILADELPHIA 7, PA. LOCUST 7-3372

For More Information Circle 659, Page 39

SAVE EXTRA HANDLING!

WITH

DUAL-PURPOSE CORE TRAYS



The Dual-Purpose Core Tray can be used for baking the cores, thus eliminating transfer of cores from core plate to core tray.

Because of their lock-stacking features, these trays make possible storage from the floor up. Bins and racks are no longer necessary.

SPECIFICATIONS

Size: 12" x 24"
LOADING HEIGHT: 4½", 6", 7"
OVERALL HEIGHT: 5½", 7", 8"
WEIGHT: 9½ POUNDS
MATERIAL: 16 GA. SHEET METAL
SPOT WELDED (28) POINTS
ALL ROUNDED CORNERS
2 BOTTOM REINFORCEMENT ANGLES
CONSTRUCTED FOR STACKING

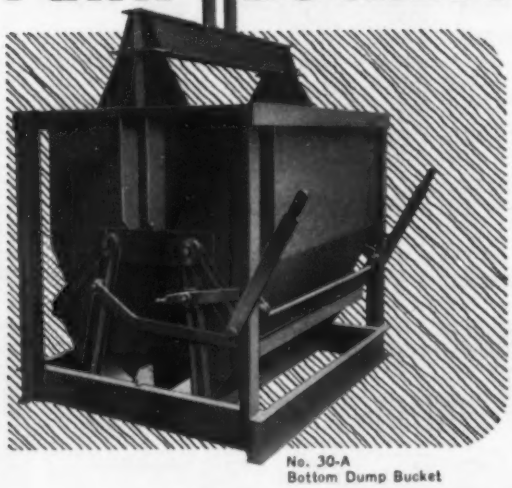
FOUNDRY SUPPLIES & EQUIPMENT

4727 S. Hoyne Ave., Chicago 9, Ill.

Phone: Virginia 7-0120

For More Information Circle 665, Page 39

PENN BUCKETS



No. 30-A
Bottom Dump Bucket

Exclusive design makes this bottom dump bucket easy to operate . . . easy to open. Efficient for foundry use in handling all types of sand, moulding or core, dry or prepared. Can be used with coke, scrap iron and castings also. Sizes 7 to 200 cu. ft.

Write Today for Catalog • Prices Quoted on Application

PENN IRON WORKS, INC.
READING, PENNA.

For More Information Circle 666, Page 39

NEW

DIAMOND FOUNDRY SODA ASH BRIQUETTES

for fast, efficient, desulphurizing action

No inactive ingredients to add to cost. Pillow shaped for easy handling and fast, efficient desulphurization of molten metal in cupola or ladle. Diamond Foundry Soda Ash Briquettes permit greater use of scrap metal in melting, release entrapped gases and increase fluidity. Tough, moisture-proof 100-lb. bags keep them dry, effective and safer to use.

For prompt shipment and technical assistance, call your nearest Diamond sales office.
Diamond Alkali Company, Cleveland 14, Ohio

4701 Paddock Cincinnati, Ohio REdwood 1-3200	12 South 12th St. Philadelphia 7, Pa. WAlnut 5-8017	4246 Forest Park Blvd. St. Louis 8, Mo. JEfferson 5-2232
20 N. Wacker Dr. Chicago 6, Ill. STate 2-9550	Oliver Building Pittsburgh 22, Pa. GRant 1-7500	Box 2088 DeSoto Station Memphis, Tenn. BRoadway 2-1736
421 Hanna Bldg. Cleveland 15, Ohio SUperior 1-8683	1006 Main St. Houston 2, Texas FAirfax 3-7329	99 Park Avenue New York 16, N. Y. OXford 7-0440

Other Diamond Chemicals for the foundry: MOROC, silicate CO_2 binder, Caustic Soda, Chlorine, Solvents

Diamond Chemicals

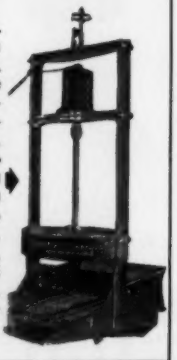
For More Information Circle 667, Page 39

PRECISION-PERFORMANCE AT LOWER COST!

COMBS GYRATORY RIDDLES

"Greatest Name in Motion"

TYPE "CS". Complete price $435.00. 24" square sieve. A continuous operation sieve. Requires no dumping, as refuse is ejected off to one side. Height 4'10", weight 295 lbs, ⅓ H.P. enclosed motor.



TYPE "CR". Complete price $425.00. 24" dia. round sieve. Sifts, fluffs, mixes, aerates sand. Height 4'6", weight 250 lbs., ⅓ H.P. enclosed motor.

TYPE "HL". Price $315.00 complete, less sieves. Laboratory model especially designed for laboratory sand control, fitted with 1/6 H.P. enclosed motor.

PROMPT DELIVERY from your Foundry Supply House

TYPE "V". Price, 20" Sieve, $330.00. Does the work of 10 men. Screens sand, Fine, Medium, and Coarse. 20" dia. sieve with special clamp for 5-second changes. Height 4'6", weight 100 lbs., fully-enclosed 1/6 H.P. motor. Also available in Giant V-5 with 36" sieve for triple capacity . . . Price $600.00

MAIL THE COUPON NOW!

GREAT WESTERN MFG. CO.

Leavenworth, Kansas Phone MU-22291

☐ Send Additional FREE Information

NAME

ADDRESS

CITY STATE

For More Information Circle 668, Page 39

¾ yd. capacity for fork lift truck use

HANDLE BULK MATERIALS WITH ECONOMY AND EASE IN CHASE DUMP HOPPERS

Sturdy construction and careful balance make this self-dumping hopper ideal for handling bulk materials, parts, scrap, etc. Models for use with platform or fork lift truck. All welded construction, using 3/16" steel plate. One man can operate the hopper alone — the hopper automatically dumps and returns to locked upright position. Special styles may be stacked full or empty. Sizes to suit your needs. Write for catalog sheet and prices.

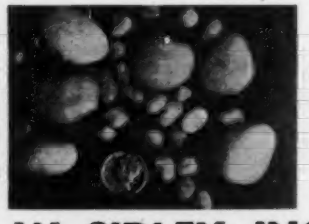
Chase FOUNDRY & MANUFACTURING CO.

2900 Parsons Avenue • Columbus 7, Ohio

For More Information Circle 669, Page 39

HIGH QUALITY SILICA QUARTZITE PEBBLES

HIGH QUALITY • LOW ALUMINA



FINELY GRADED TO DESIRED SIZE

R. W. SIDLEY, INC.

TELEPHONE CY 8-3232

THOMPSON, OHIO

For More Information Circle 670, Page 39

FOUNDRY CONSULTANTS

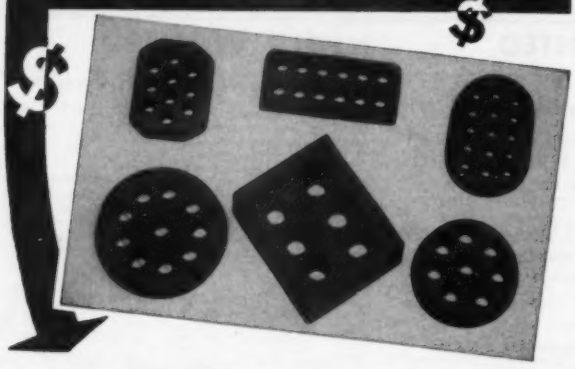
APPRAISALS . . . WAGE INCENTIVE PLANS . . . COST SYSTEMS . . . EXECUTIVE CONTROL . . METHODS PRODUCTION CONTROL SYSTEMS . . . PLANT REMODELING . . PLANT DESIGN . . CONTINUOUS SYSTEMS . . . SEMI-CONTINUOUS SYSTEMS . . . PRESENT OPERATION MODERNIZED

EDWIN S. CARMAN, INC.

1645 LEE ROAD CLEVELAND 18, OHIO

For More Information Circle 671, Page 39

Save Money *with* RUDOW STRAINER CORES



Custom Made • Will Duplicate Your Sample or Drawing • Unlimited Design Range • High Heat Resistance • Extra Hard • Saves Time–Trouble

RUDOW quality Strainer Cores cut rejects, cut costs, keep castings free of oxides, slag and impurities—simplify gating control and metal flow, for greater production. We offer you Free Samples of RUDOW Strainer Cores—made like your sample, or from your drawing. Write today—or phone MAin 6-1163.

SEND FOR FREE BULLETINS, PRICES ETC.

RUDOW MANUFACTURING CO.
2602 Venice Rd. • P. O. Box 2121 • SANDUSKY, OHIO

For More Information Circle 672, Page 39

CENTRIFUGALLY CAST
CYLINDER LINERS FOR HIGH PRODUCTION

MODEL MLS

ONE MAN OPERATION
METALLURGICALLY CONTROLLED METAL

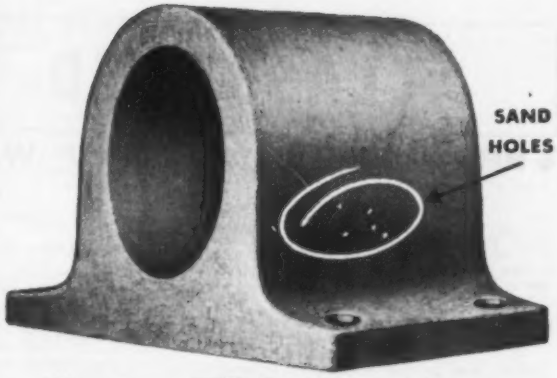
Pneumatic control system—Measured molten metal—Timed spin—Automatic spraying—Sturdy construction for continuous operation by unskilled labor.

This is only one of many machines designed for high production of better castings, made centrifugally. Technical advice and mold design service available to all customers.

Write for Illustrated Bulletin No. 161

CENTRIFUGAL CASTING MACHINE CO.
P. O. Box 947 Tulsa 1, Oklahoma

For More Information Circle 673, Page 39



Save This Casting *with* SMOOTH-ON FOUNDRY CEMENTS

Often a perfectly good casting has blow or sand holes, surface blemishes, or rough and porous areas that detract from its appearance. But there's no reason why it can't *look* as good as it really is.

Simply use Smooth-On Foundry Cement. It goes on easily, quickly . . . hardens rapidly at a predictable rate . . . stays firmly in place.

SHADINGS TO MATCH ANY CASTING
4A • Medium Gray
4AA • Light Gray
4B • Dark Gray

Quality Control That Assures You of Tight, Lasting Repairs

Every lot of Smooth-On Foundry Cement is laboratory tested for setting time, hardness and color. You can be sure of tight, lasting, good looking results every time, provided the directions are followed.

See how much better your castings will look after treatment with Smooth-On, known and used by leading foundries for more than 63 years. Try one or more of these cements at our expense. Write today—on your business letterhead—and we will send you free samples.

SMOOTH-ON MANUFACTURING CO.
570 Communipaw Ave.
Jersey City 4, N. J.

FREE SAMPLES

SO-388

SMOOTH-ON FOUNDRY CEMENTS

For More Information Circle 674, Page 39

CLASSIFIED ADVERTISING

• HELP WANTED

SQUEEZER FOREMAN

Jobbing gray iron foundry in New England needs experienced squeezer molding foreman. Must have knowledge and experience with incentive systems, gating and risering. Opportunity for advancement.

BOX 112, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SUPERINTENDENT

Medium size jobbing steel foundry located in Midwest. Age 40 to 55 preferred. Reply giving complete employment history, education, personal data, and recommendations. Replies will be held strictly confidential. Address: Box 969, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

TOPNOTCH MOLDING FOREMAN

For jobbing steel foundry in Midwest. Must know pattern layout, heading and gating and sand control. Address: Box 961, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

JOURNEYMAN WOOD PATTERN MAKER

Medium size foundry in northern Ohio. Age 25 to 35. High School Graduate. Reply state age, experience and references. Address: Box 986, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY ENGINEER

A young graduate mechanical or industrial engineer will find a challenge in the position of Foundry Engineer with special alloy and stainless steel foundry in Ohio.

Working directly under an engineer in the foundry management, the Foundry Engineer will be responsible for planning and improving the production of corrosion-resistant castings.

Two or three years of foundry experience and management potential desirable.

BOX 102, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

JR. FOUNDRY METALLURGIST
$7200 to $8400

Promotable type young man to join rapidly expanding organization that places a great deal of emphasis on engineering proficiency. Client pays fee. Contact Robert L. Moore in confidence.

MONARCH PERSONNEL
28 EAST JACKSON BLVD.
CHICAGO 4, ILLINOIS

PLANT MANAGER

Medium-heavy mechanized Meehanite iron foundry. Midwest location. 150 employees. Excellent future. State education, experience, salary requirements, etc. Furnish late picture. Write Box 106, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY METALLURGIST

Degree or equal—25 to 35 years of age—4 years' or more experience in steel or gray iron. Knowledge of heat treating, melting and sand technology desirable. Apply Personnel Department. . .

GUNITE FOUNDRIES DIV.
KELSEY-HAYES CO.
301 PEOPLES AVE. ROCKFORD, ILL.

PATTERN SUPERVISOR

To assume full responsibility for directing all pattern operations in malleable foundry located in New York State. An excellent and unusual opportunity. Replies confidential. Address: Box 967, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SQUEEZER FOREMAN

Jobbing steel foundry needs squeezer molding foreman. Must know heading and gating. Excellent opportunity for advancement. Address Box 981, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY FOREMAN

Gray iron foundry, experienced in coremaking, molding, cupola, sand, and patterns. Must know gray iron and some knowledge of ductile iron desirable. Require at least six years' experience in foundry supervision. We are a progressive Eastern Seaboard company. Good salary plus company paid benefits. Send summary of background. Address: Box 963, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• HELP WANTED

METALLURGIST

Experienced in all phases of electric steel foundry.

ST. LOUIS STEEL CASTING INC.
100 MOTT ST. ST. LOUIS, MO.

MIDWEST MALLEABLE NEEDS

Foundry Metallurgist

Metallurgical degree, will assume responsibility of melting, heat treating, laboratory and sand control.

*****

Chief Inspector and Quality Control

To take full charge of Inspection Department and set up quality control program.

*****

General Molding Foreman

Experienced in gating and risering, efficiency costs, to take full charge of 120 employee department.

BOX 107, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SALES—METALLURGICAL PRODUCTS

Sales engineer with technical background, willing to travel. Well established products in steel foundry and heat treating fields. Send resume and salary requirements. Address: Box 984, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

EXPERIENCED MELTER

Electric Arc Furnace, acid practice, carbon, low alloy steel, ladle linings. Salary open. Replies confidential. West Coast Location. Address: Box 973, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY MANAGER

Jobbing iron foundry—to 8 tons. Eastern location. Engineering degree preferred. Age 35-40. Send complete details in confidence. Address Box 983, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SENIOR INDUSTRIAL ENGINEER

Excellent growth opportunity. Must have background in standard data, estimating and methods. Midwestern foundry location.

BOX 108 FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SALES ENGINEER

Experienced in selling quality castings for newly modernized foundry. Knowledge of foundry operations and processes essential.
We are moving ahead and need good men. Foundry is only one of Company's Divisions. If you have "get up and go," send resume! Replies held confidential.

BOX 971, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

HELP WANTED

Methods-Time Study job opening for an aggressive man!

BOX 999, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY CHEMIST WANTED

Leading supplier to the foundry field

Has outstanding opportunity for

Male foundry chemist

Capable of formulation in the

Field of fluxes and

Exothermic materials.

Must have manufacturing know-how.

Send complete resume to:

BOX 964, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

• HELP WANTED

STEEL CASTING PLANT MANAGER WANTED

Excellent opportunity for efficient and successful man of experience in both miscellaneous and semi-production steel and alloy castings up to 18,000 lbs. Must have know-how to operate foundry efficiently and successfully in getting low man-hours, highest yield, minimum scrap, etc. Have full Union cooperation, like management, wants results. Employees know of this ad. Only qualified need answer with complete resume, references and education. Address: Box 968, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MELTING SUPERINTENDENT

Age 30 to 45, metallurgy background, experienced cupolas and electric furnaces (duplexing). Reply with resume and references. Central Michigan. Address: Box 966, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERVISOR

Molding Department. Experienced in high quality alloy steel castings, advanced shank and screw ladle pouring practice, machine molding. Salary open. Reply confidential. West Coast location. Address: Box 972, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

STEEL FOUNDRY SUPERINTENDENT

Medium size steel foundry near Cleveland, specializing in medium jobbing work. Must know all phases of steel foundry operations and alloys. In reply give age, experience, and references.

BOX 977, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

• OPPORTUNITY

COMPLETE FOUNDRY CREW AVAILABLE

Ductile and gray iron foundry, in the process of liquidation, has an excellent group of executive, sales, supervisory, clerical, and factory personnel who are available immediately. Detailed resumes on specific individuals will be supplied as requested.

BOX 101, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

• POSITIONS WANTED

SUPERINTENDENT—GENERAL FOREMAN

Practical and technical; presently employed in the East; over 30 years' experience; jobbing or production to 5 tons. Address: Box 999, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT-MANAGER

Twenty years' experience as superintendent and manager of ferrous jobbing and production foundries. Sales and metallurgical background. Practical and technical experience in all departments. Age 48. Now employed. Address: Box 987, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPPLY OR EQUIPMENT SALESMAN

Thirty years as foreman and superintendent in high production foundries. Would now like to have position as salesman for a reliable company selling foundry supplies or equipment. Address: Box 998, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Excellent background in core room, cupola, molding, cleaning and maintenance—iron and steel. Presently employed as General Foundry Foreman. Will relocate. Age 33. Address: Box 991, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGEMENT ASSISTANT

Experience in all duties of management including time-study and incentives. Aluminum and gray iron foundry experience. Resume sent upon request. Address: Box 993, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GRADUATE MECHANICAL ENGINEER

Ten years' experience in plant layout, machine design, cost estimating, job set-up, and sales in large mechanized gray iron foundry. Interested in responsible position with chance to advance. Presently employed. Address: Box 960, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Thoroughly experienced in the management of gray iron production or jobbing foundries. Qualified to show you a highly efficient operation. Address: Box 992, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• POSITIONS WANTED

PRACTICAL-TECHNICAL SUPERINTENDENT
Gray iron superintendent with 30 years' broad experience, jobbing, high production, mechanization producing quality castings from few ounces to twenty tons. Molder by trade. Graduate metallurgist. Well versed in all phases modern methods to produce at minimum costs. Address: Box 104, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

DESIGNER OF PERMANENT MOLDS
Specialist in missile and aircraft castings of Aluminum and Magnesium. Location New York —New England area. Address Box 980, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ENGINEER
Fourteen years' diversified experience in the field of foundry operation and engineering. Age 37. Interested in a responsible position of foundry engineer, plant engineer or foundry equipment designer. Address: Box 978, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER-SUPERINTENDENT
Thirty years' experience in steel, high alloy, iron, nodular and malleable. Age 51. Castings up to 20 tons. X-ray and magnaflux quality. Can produce at a profit. Good labor relations. Resume on request. Address: Box 995, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER
Graduate mechanical engineer. Thirteen years' experience in heavy iron foundry on castings up to 15 tons; past five years as general manager. Age 37. Now employed. Available October 1. Address: Box 105, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MOLDING FOREMAN
Twenty years' EXPERIENCE in steel foundry. Floor molding and machine molding; Bumpers or slingers. All types castings to 20 tons. Address: Box 994, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERVISOR, TIME STUDY OR COREROOM
Young man seeking a challenging position with a future. Seven years of experience in establishing and installing incentive plans. Five years in charge of coreroom. Address: Box 989, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN
Competent and progressive foundryman would like to make change. Will relocate. Address: Box 100, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER
Practical foundryman, nationally known for a job well done. Age 48. Good health. Now employed. Looking for more action ferrous or nonferrous. $15,000 minimum. Address: Box 979, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT—MANAGER
Technically, practically familiar with every phase of foundry operations. Broad experience in ferrous and nonferrous. Will relocate anywhere. Address: Box 974, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERVISOR
Thirty years' experience supervising in gray iron foundries; both jobbing and high production on squeezers, rollovers and sand slingers. Well versed in sand control, gating and cupola operations. Address: Box 997, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• REPRESENTATIVES WANTED

REPRESENTATIVE WANTED
Well equipped brass and bronze foundry desires sales representative for Pennsylvania, New Jersey, Maryland area. Please state current representation and area now covered.

BOX 996, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

REPRESENTATIVES WANTED
To handle district sales of epoxy patching and repairing material—92% metal, ferrous or nonferrous. Most districts open. Liberal commission.

BOX 103, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

CONSULTANTS

FOUNDRY CONSULTANT—NONFERROUS
Sand casting—Permanent mold casting—centrifugal castings—in aluminum, brasses, bronzes, 30% leaded bronze—aircraft quality bearings and castings. Address: ED JENKINS, West Palm Beach, Florida. PHONE: TEMPLE 2-8685.

CONSULTANT
In foundry operations gray iron, malleable iron and steel. Address: HERBERT F. MILLER, 589 Trade Winds Drive, Dunedin, Florida.

• EMPLOYMENT SERVICE

FOUNDRY PERSONNEL SPECIALISTS
National Placement and Procurement of
GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS
Confidential Inquiries Invited
From Employers and Qualified Applicants
For Fast Competent Assistance Contact
DRAKE PERSONNEL, INC. FINANCIAL 6-8700
JOHN COPE, DIRECTOR, 29 E. MADISON ST., CHICAGO 2, ILL.

• ACCOUNTS WANTED

LINES WANTED
Nationally known
Well established supply house
wants to add new lines
for its aggressive sales force
to sell to the entire
foundry industry.
Interested parties write
to:

BOX 965, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

• FOUNDRY FOR SALE

FOUNDRY FOR SALE
Small gray iron foundry, 20 to 30 employees. Capacity 6 to 8 tons daily. Now operating. Located, eastern New York. Address: Box 955, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY FOR SALE
Located in the Arkansas River Valley, 113 miles south of Denver market. Currently working six days per week. We have been in continuous operation since 1900. Company is incorporated. Will sell all or part of stock. There will be three key men for leadership. Gross sales for May—$7,000.00.

BOX 982, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

• FOUNDRIES WANTED

EQUIPMENT WANTED
South American Manufacturer wants to purchase complete foundries, without property, for own use. Plants must have large capacities. We are ready to do business as soon as we receive complete details as to price, equipment, inspection, etc. All replies confidential.

BOX 109, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

• WANTED-TO-BUY

WANTED
Motive slinger, raise—lower. Stationary Slinger, raise—lower. Handy Sandy. Clam Bucket, one yard, single line. Also will sell-trade, Newaygo Reddy Sandy Shake Out, Model RS—VM. Address: Box 970, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED-TO-BUY
1200 Pound Brass Melting Furnace. Must be Stromen Sklenar type, gas fired, complete with burners and blower. Address: Box 962, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOR SALE

FOR SALE
12 x 10 Chicago Pneumatic Compressor with 60 H.P. Motor. Capacity 300 CFM. Compressor completely overhauled. Excellent condition. Price $1,450.000 f.o.b. Alpena. Address: THUNDER BAY MFG. CORPORATION, Alpena, Michigan. Phone: ELMWOOD 4-3181.

• FOR SALE

FOR SALE
2 Shaico MC-5 Shell Core Machines
1 #400 Clearfield Muller
PIONEER FOUNDRY & MFG. CO., INC.
GILBERTVILLE, MASS.

SHELL CORE MACHINES
2—SPO SC-30A-1 fully automatic Holo Core Machines.
Used 1½ years. Excellent condition.
18 x 22 gas fired platen. .....$3500.00 each.
NOBLESVILLE CASTING CO., INC.
NOBLESVILLE, INDIANA

REPAIR AND REBUILDING SERVICE ON ALL PNEUMATIC TOOLS
We try to carry a complete line of "Hard Chrome Rebuilt Tools" at about half the cost of new tools. Before you discard your old tools, why not send them to us for our estimate on the cost of renewing them with our Hard Chrome Process?
CENTRAL PNEUMATIC SERVICE, INC.
512 LINDEN AVENUE
DAYTON 3, OHIO
PHONE: CL 2-2701

FLASKS . . . . FLASKS . . . . FLASKS
We have hundreds of good used flasks and jackets in all sizes.
SAVE TIME AND MONEY!
Write for our latest Flask list.
INTERNATIONAL FOUNDRY SUPPLY COMPANY
P. O. BOX 1053, READING, PENNSYLVANIA
PHONE: FR 6-0794

FOR SALE
AMERICAN MODEL "AA" SANDCUTTER—4' 8", No. 906. Can be inspected in operation. Any reasonable offer accepted. Address: 1014 West 12th Street, Erie, Pennsylvania. PHONE GLENDALE 6-2038.

SWING GRINDERS
FOR SALE
(Used—Excellent condition!)
FOX 10 hp. 3/60/220/440 Volt takes up to 18" x 2" wheel $650.00
MARSCHKE 15 hp. 220-440 V. takes up to 24" wheel .....$750.00 each
C. GREENE EQUIPMENT CORP.
4014 W. 24th ST.
CHICAGO 23, ILLINOIS
LAFAYETTE 1-1322

FOR SALE
B & P Model 6024, 6000# hydraulic rollover draw machine complete and in excellent shape 24" draw, 64" daylight, straight-in conveyor, 90° rollout conveyor.
B & P Rotomold, four roller conveyor station, pneumatically operated, 18' dia. indexing table, capacity 6000# per station, complete and in excellent condition.
Both may be seen in operation. Will sell separately or as a unit.
BOX 976, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY EQUIPMENT AVAILABLE FROM OWNERS

Simpson Muller Ser. 113155—1-F-UD 1955—C/W—Skip Hoist, Water Meter; T.E. Mtr. 7½ HP—220/440—1750 RPM.
Beardsley & Piper #50-A Speed Muller Ser. 215-5406—C/W Skip Hoist—Water Meter & Etc., Installed 1955 9 Cu. Ft. Cap. T.E. 50 HP Mtr.
Beardsley & Piper #60 Sand Preparator—Ser. 215-5406 installed 1955.
Beardsley & Piper—Motive Jr. Installed 1950—1st. Arm—12′ Ramming Unit 4′, 19″ Head W/4″ Tip,—2 Speed 13/20 HP 1200/1800 RPM. Arm Mtr. 2 HP-950 RPM C/W Magnetic Separator—Rectifier Elevator & (2) 200 Cu. Ft. Crane Type Hoppers, 300′ Cable Reel.
Beardsley & Piper Mulbaro's (2)—W/6 Extra Barrels.
Hough Payloader Model—HA—Ser. 26712—Pneumatic Tire Towmotor—Ser. 680 P 60005—1960—Spec. #332 Model 680 DLP Lift 120″—Cap. 8000# at 24″ Load Center 48″ Forks Propane Fuel.
Automatic Transporter—Walking Type—42″ Forks—Cap. 2400# Rubber Tire—12 Volt—C/W Hobart Charger. C/Unit Like New.
American-Model "F" Core Rod Straightener ⅜″ x 1¼″—Shears ¾″—Forms ⅝″ Gaggers (New Never-Used).
American Wheelabrator—72″ Swing Table installed 1952—Exc. Condition W/Dust Collector.
Joy Air Compressor—100 H.P. 220/440—13½ x 8 x 7 Model-E-Class WN112 Max. Pressure 125# Max Speed 600 RPM—Installed 1958 After Cooler, Water Trap-Air Receiver C/W All Electric's.

MISC. EQUIPMENT

Hyster-Karry Crane 10,000#, Clamshell, Fox Stand Grinder 24″ S.H., Welders, Flask Clamps, Hoists, Rammers, Grinders, Cupola Charger & Drop Bottom, Buckets, Ladles, Core Plates, Flasks, Air Hoist, Lockers, Office Equipment, 52″ Magnet, Molding Machines, Foundry Supplies, and Other Misc. Items.

RIVERSIDE IRON WORKS
10640 So. Buffalo
Chicago 17, Illinois
Telephone—374-1322

• FOR SALE

C. GREENE EQUIPMENT CORP.

GOOD USED
FOUNDRY EQUIPMENT

SPO Jolt, Pin Lift, model 3072
SPO Jolt, Squeeze Pin Lift, model 2138C
SPO Model 9546 Jolt, squeeze, rollover draw
Simpson No. 1 UD Muller
Simpson No. 1½ UD Muller
Simpson No. 3 Enclosed gear Muller
Simpson No. 1 Open gear Muller
J & J Model 918 Rollover
International Model 30x8 Rollovers
International Model 24x10 Rollovers
International Jolt pin lifts all sizes
J & J Model 8128 Jolt pin Lifts Table 30x38
SPO Rollover pattern draw Model RD 6815 table 36 x 68 draw 15″
International plain jolt machines all sizes
International core blowers all sizes
Champion core blower Model CB 10
International hand operated pin push ups
Pangborn Table cleaning machine Model LG6 with 6′ table and 24″ aux. tables complete with Dust Collector
Ingersoll-Rand 100 hp Air Compressor
Air Compressors 25 hp.
Whiting coal pulverizer Model 30 complete
Whiting coal pulverizer Model 30A complete
Dust Collectors many sizes
Fisher Aluminum Melting Furnaces 1000 lb cap.
Fisher Aluminum Melting furnace 300 lb. cap. motorized nose pour gas fired
Bondactor Model 1000L
Tessmer sprue cutters
Hough Payloaders Model HA ½ yard
Tractomotive payloader ¾ yd. cap.
Air hoists 1000 lb. to 4000 lb.
Ladles all sizes
Steel flasks all sizes
Core ovens all sizes
Beardsley & Piper Tractor type slinger

Many More Items Available

WE SOLICIT YOUR INQUIRIES

WE BUY WE SELL WE TRADE

C. GREENE EQUIPMENT CORP.
4014 W. 24th St.
CHICAGO 23, ILLINOIS
LAFAYETTE 1-1322

FOR SALE

JEFFREY—10 molders' hopper molding units, complete with 24″ distributing belt, 7½ HP motor and starter—knocked down, ready for reassembling. Good Buy.
SIMPSON #2 Muller O/G—"cheapie," but in good running condition.
MULBARO—B & P—3½ cu. ft. Splendid.
OSBORNS—#559 jolt pin lift and #275-J jolt squeeze, both rebuilt and guaranteed.
TUMBLASTS—American 36 x 42 and 48 x 72, both good machines and well worth the asking price.

Other good equipment—try us

McMAHON AND COMPANY, INC.
P. O. BOX 3014A AVONDALE STATION
BIRMINGHAM 12, ALABAMA
PHONE—592-4201

- **WHITING** Cupola, 17 Tons, 1954
- **WHITING** Cupola Charger, 5 Tons, 1954
- **PANGBORN** Blast Cleaning Room, 16′ x 16′ x 11′, 1948
- **PANGBORN** Rotoblast 32″ diam. x 54″ wide, 1948
- **ALLIS-CHALMERS** Foundromatic Shakeout, 25 Tons, 8′ x 10′ deck, 1957
- **AMERICAN** 32,000 CFM Roto-clone dustcollector, 1957

!EXCELLENT CONDITION!

Murray Grainger

CAPITAL EQUIPMENT CORP.
40 Walnut Street Newark 2, New Jersey
PHONE: MArket 2-5222

FOUNDRY CLOSED

EQUIPMENT AVAILABLE

CARL MAYER Vertical Core Oven installed 1959. Conveyorized-loading and unloading mechanism. Rack size 90″ x 25″—oven height 45′—10′ wide—11′6″ long. Gas or oil fired. 30 rack capacity; racks adjustable 0″-24″; variable speed conveyor; complete electrical controls.
JOY Compressor—Class-WN-112-E. Size 16—10 x 7. Water cooled—(2) stage double acting. After cooler, receiver, inter-cooler and compensator. Ser. 55259.
BEARDSLEY-PIPER Core Slinger. Installed 1959.
(2) #70—9 MILWAUKEE Core Grinders
(1) #3 Climax Wire Straightener
(1) INTERNATIONAL Type AN—Rollover, air clamps, air draw. Purchased 1959.
(2) SIMPSON Mullers #2 UD-Drives. Aerators, skip loaders, water meters and air operated discharge.
35 Molding Machines: MILWAUKEE 276-J, OSBORN #243—27″ x 40″ rollovers, OSBORN jolt strippers 25″ x 30″, OSBORN #559 jolt strippers, OSBORN #242 jolt rockover pattern draw and others.
MISCELLANEOUS EQUIPMENT: Tons Foundry Supplies; (25) pneumatic hoists; (3) HOUGH Payloaders; HAMMOND Grinders; 2000 Ft. Roller Conveyors; HEWITT ROBINS Shakers—JF-9, 4′ x 6′; Pyrorefractory gun; rammers; grinders; riddles; pouring devices; ladles; chain falls; hoists; belting; SIMPSON Lab. Muller; GOGAN tester model D-11; scales; transformers; motors; BUGIT Hoist; welders; CLARK Utilitruc; tumbling mill; PANGBORN Equipment; sand storage bins
AND MANY OTHER ITEMS!

COMPLETE FOUNDRY LABORATORY AND LATE MODEL OFFICE EQUIPMENT

Equipment located at:

FULLER FOUNDRY
1527 Fulford Street
Kalamazoo, Michigan
Telephone: FIRESIDE 9-1445

• FOR SALE

G-U-A-R-A-N-T-E-E-D
SAND BLAST EQUIPMENT
SELL BUY TRADE
TERMS AVAILABLE
Designers and Erectors of Specialized Blast Equipment

14' Wheelabrator Table Blast Model 4 with 4-66" Spin Tables like new $10,000.00
4' Wheelabrator Table Blast 2250.00
6' Wheelabrator Table Room 6000.00
6' Wheelabrator Air Table 1700.00
48 x 48 Wheelabrator Tumblast 3000.00
42 x 48 Wheelabrator Tumblast 2750.00
36 x 42 Wheelabrator Tumblast 1500.00
4' Sly Air Table 600.00
27 x 36 Wheelabrator like new 3000.00
Sly Air bbl #4 ..... 350.00
9 LG Pangborn Table w/6-36" Spinners $4000.00
6' Pangborn Swing Table, Like New 6000.00
Pangborn 53 EN-2 Hand Cabinet 325.00
Rumelin 8 x 8 Room 1000.00
Pressure Tanks, all types .....$150.00 up
Vapor Blast Cabinets 400.00
Vapor Blast Automatic Table 2500.00
All types and sizes of Hand Cabinets, Dust Collectors, Pressure Tanks, Rooms, Horizontal or Vertical Tumbling Barrels and Additional Sand Blast Equipment too numerous to mention. $100,000 worth of Wheelabrator and Pangborn Spare Parts Priced 25% to 50% Less List.

170 STEEL SHOT MIXED WITH G80 STEEL GRIT .....$125.00 ton

DIAMOND SAND BLAST EQUIPMENT CO.
5654 W. Jefferson Ave.
DETROIT 9, MICHIGAN
VI-3-6750

ELECTRIC ARC FURNACE

Lectromelt "More Rapid" Electric Arc Furnace, 2 ton capacity. Top charge. Swing hood. With transformers and controls. Late model. Or will lease furnace and property.

MELTING CORP. OF AMERICA
OSTEND & RIDGELY STS. BALTIMORE, MD.
LEXINGTON 9-1980

FOR SALE

One Used #3 Unit Drive Simpson Muller. Good condition. Address: Box 975, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOR SALE

FOUNDRY EQUIPMENT

Shell Molding Machine, Model 404 "Shalco" Sand Blast Cabinet "Wheelabrator" complete with conveyor, speed reducers, starters, pressure tank and shot return elevator, separator and storage hopper.
Furnace, rotary, gas-fired, 1-ton capacity, complete with blowers & motors and speed reducers.
Furnace, rotary, "Hopkins" 10-ton complete with blowers and motors, oil-fired.
Furnace, "Lindberg" Rotary 10-ton complete with blowers and motors, oil-fired.
Briquetting Machine—"Economy" electric, style 112 FC, Serial 24323.
Magnetic Separator—"Dings" 18 x 48 complete with DC unit.
Magnetic Separator—"Dings" 15 x 38" portable, complete with DC unit.
Turnings Crusher "Jeffrey" Model DFMT40, 30 HP motor, 220/440 Volt.
Hoist—2-ton electric, "No. Eng." Hi-Lift.
Hoist—2-ton Electric "Detroit".
Blowers, Spencer Turbine 225 CFM, 12 oz., 1½ H.P. Motor.
Blower, Spencer Turbine 550-CFM, 20 oz., 5 HP Motor.
Blower, Spencer Turbine 1000 CFM, 24 oz., 10 HP Motor.
Cupola "Whiting" water jacket, skip-hoist, blower and motor, bucket elevator and hopper.
White Metal melting furnace, pot dia. 28", gas-fired.
Molds for solder and babbitt, water-cooled. Reg. bar, capping bar, octagon and ladles.

BOHN ALUMINUM & BRASS CORPORATION
WO. 3-0655 MR. WARD
DETROIT, MICHIGAN

FOR SALE

TUMBLAST WHEELABRATOR—36 x 42, Serial No. A-13364. Can be inspected in operation.

Any reasonable offer accepted. Address: 1014 West 12th Street, Erie, Pennsylvania. PHONE GLENDALE 6-2038.

• FOR SALE

FOR SALE

Complete Dietert sand lab.
1—Foundry Equipment Co., 500,000 BTU mold dryer.

MEECH FOUNDRY INC.
9906 MEECH AVE. CLEVELAND 5, OHIO
PHONE: MICHIGAN 1-5550

Lost Lease! Must Vacate!
EVERYTHING MUST BE SOLD

Motive Jr. Sandslinger—19" head —4" tip—2 speed—25/16 h.p.—extra head $3500.00
American Wheelabrator tumblast —27" x 36" $2000.00
Tannewitz 30" band saw—variable speed drive—new in 1960 ..... $1500.00
10—SPO 110 PJ jolt squeezers ..... (ea.) $ 200.00
Osborn 275J jolt squeezer ..... $ 225.00
2—B&P #M screenerators (ea.) $ 500.00
2—B&P #8 screenerators (ea.) $ 250.00
SPO #2114G Jolt Squeeze Pin Lift —20" x 27" table—4" draw ... $ 500.00
Detroit 10,000 lb. air hoist w/trolley, Unused ..... $ 550.00
Racine Band Saw—14" geared drive ..... $ 250.00
2—Optical pyrometers ..... $ 200.00
3—Redford #1 core blower w/air clamps—cartridges .....(ea.) $ 75.00
2—Tabor 22" x 22" jolt rollovers .....(ea.) $ 250.00
Spencer Turbo 30 h.p. blower .. $ 250.00
3—Simpson #2 Mullers—style C w/loaders & aerator & water meter .....(ea.) $2000.00
B & P #50 Speedmuller w/loader, water meter $4500.00

PEK MACHINERY COMPANY
130 JACKSON ST.
BROOKLYN 11, NEW YORK
PHONE: EVERGREEN 8-3277 & 3278

FOR SALE

36" x 42" AMERICAN WHEELABRATOR, Serial No. A68000. Address: WELDON F. STUMP, 4835 Crestridge, Toledo 13, Ohio.

FOR SALE

SHALCO—M-C-3 core blower for up to 10" x 12" x 6" box. New last year. Subject to prior sale. Address: Box 988, FOUNDRY, Penton Bldg., Cleveland 13, Ohio

LIQUIDATION

FORMER PHOENIX STEEL CORP. PLANT AT HARRISBURG, PA.

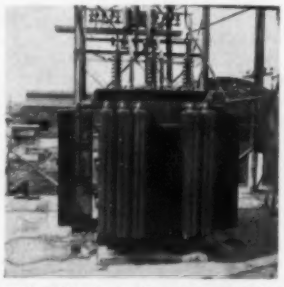
FOUNDRY ITEMS AT FRACTION OF ORIGINAL COST

OVERHEAD TRAVELLING CRANES

(1)	150 Ton/40 Ton Morgan	Ladle Crane 59'-6" Span
(1)	100 Ton/25 Ton Wellman	Ladle Crane 59'6" Span
(1)	40/25 Ton Milwaukee	Crane (1951) 59'-6" Span
(1)	25 Ton Milwaukee	Crane (1949) 68'-0" Span
(1)	20 Ton Milwaukee	Crane 69'-4" Span
(2)	20/5 Ton Shaw Box	Crane 65'-0" Span
(1)	20 Ton Milwaukee	Crane (1949) 46'-10" Span
(1)	15 Ton Northern	Crane 68'-3" Span
(2)	15 Ton Morgan	Crane 64'-0" Span
(1)	10 Ton Alliance	Crane 70'-0" Span
(1)	10 Ton P & H	Crane 68'-3" Span
(1)	10 Ton Shaw Box	Crane 69'-4" Span
(1)	10 Ton Shaw Box	Crane 64'-6" Span
(1)	10 Ton Alliance	Crane 64'-6" Span
(1)	10 Ton Milwaukee	Crane 65'-0" Span
(2)	10 Ton Alliance	Crane 60'-0" Span
(4)	10 Ton Alliance	Crane 56'-6" Span
(1)	5 Ton Alliance	Crane 64'-6" Span
(2)	5 Ton Alliance	Crane 61'-6" Span
(1)	5 Ton Cleveland	Crane 56'-0" Span
(1)	5 Ton Northern	Crane 44'-6" Span
(2)	5 Ton Alliance	Crane 40'-4½" Span
(1)	5 Ton Phoenix Stl	Crane 35'-0" Span
(1)	15 Ton Milwaukee	Bridge Only (1949) 70'-0" Span

TRANSFORMERS

(1) 7500KVA Wstghse 66000 Pri. 13800 Sec 3 PH 60 S/N 4089566 Yr. 1948

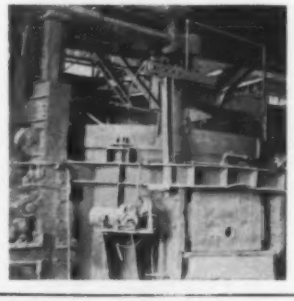


7500 KVA West. Transformer 66000-13800 Volt

(1) 7500KVA Wstghse 66000 Pri. 2400 Sec 3 PH 60 S/N 4089567 Yr. 1948
(3) 2000KVA GE 13200/26400 Pri 2400/4160Y Sec 1 PH 60 S/N 2871432; 2871433; 287140
(3) 667KVA GE 2300/4000Y Pri 460 sec 1 PH 60 S/N 4497213; 4497213; 4497215
(3) 167 KVA GE 2400/4160Y Sec 240/480-60 CY 1 PH 8n. C 381487-56P 88-00, Rebuilt
(3) 150 KVA Wstghse 2400/4160Y Pri 120/240 Sec 1 PH 60 S/N 4399362, 4399370; 4399371
(1) 25KVA GE 1100/2200 Pri 120/240 Sec 1 PH 60 S/N 1371094
(1) 25 KVA Wstghse 2200 Pri 220/110 Sec 1 PH 60 S/N 383970
(1) 25 KVA Wstghse 2300 Pri 230/115 Sec 1 PH 60 S/N 1406895
(3) 175 KVA GE 2400/2160 Pri 203/101 Sec 1 PH 60 S/N 152339; 152340; 152341

ELECTRIC ARC MELTING FURNACE

HEROULT Model 15 Electric Arc Melting Furnace. Shell Diameter 14'-0"; Inside Diameter 12'-0" Side Charge. Cold scrap charge 30,000 #/40,000 #. Electrode size 14" diameter x 60" long. Transformer General Electric 6000 KVA Primary Voltage 13,200/26,400, Sec. 265/92 volts; built in reactor. GE Automatic Control Panel. Westinghouse tot. encl. drawout switchgear. With approx. 160 spare electrodes and nipples, door frames, rings motors, etc. S/N 236 Mfd. Heroult Div. U. S. Steel Corp.



METALLURGICAL HOT BLAST CUPOLA

Rated 15/20 tons/hr. Shell dia 8'-11"; hearth dia 7'0"; stack height 40"; (12) water cooled tuyeres 3.81" dia. Heat exchanger for preheating 12,000 CFM to 950/1000° F. with Allis Chalmers blowers, motors, controls. Charging equipment, cyclone dust collector, piping, valves, operating and control instrumentation. Installed 1954.

TESTING MACHINES

(1) Tinius Olsen Tensile Testing Machine 400,000 #

ANNEALING FURNACE—CAR BOTTOM

Tate-Jones MFD. 1942
Car Size 13' W x 25' L
Door Height 7'-6"—9' Center of Arch
Fully instrumented—Oil Fired
Complete with Car Puller, Door Hoist
Excellent Condition

CUPOLA BLOWERS

(3) Allis-Chalmers Cupola Blowers, 10,000 CFM @ 2.4# Gage—350 HP motor drive 440/60/3 with starters and duct controls.

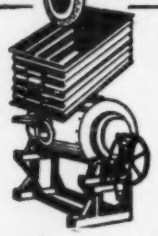
Hundreds of fans, blowers and exhaustors for combustion air, ventilation and exhausting.

Write, Phone, Wire

LIPSETT Division LURIA BROTHERS & Company, Inc.
LIQUIDATION OFFICE
915 South Front St., Harrisburg, Penna.—P.O. Box 1151
Phone: CEdar 6-5988—Arnold Landesberg, Project Mgr.

EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD **CLEVELAND 10, OHIO**



AIR HOISTS
5—300 lbs. I-R "Air-Block" Type LC3
4—500 lbs. I-R Air hoists Model A
4—1000 lbs. I-R air hoists Model B
1—4000 lbs. I-R Air hoists Model D
1—6000 lbs. I-R Air hoist Model D-6
2—5 ton I-R Air hoists Model E
1—8 ton Detroit Air hoist
6—Curtis Pendant Class G 1 to 3 ton
12—Hanna Pendant 100 lbs. to 1000 lbs.

HOISTS ELECTRIC
1—1 ton Cleveland Tramrail 220/3/60
1—1 ton Chisholm-Moore 220/3/60
1—2 ton Yale 230 V. D.C.

ROLLER CONVEYOR
1500 ft. 16", 18", 24", 30", 36"

FURNACES (oil & gas fired)
Hausfeld, Fisher, Monarch
#100 to #3000 Stationary & tilting

ELECTRIC FURNACES
1—500# Lectromelt, 225 KVA, 2200 to 191 volts
1—1 ton Heroult, 800 KVA, 4300 to 300-225-178 volts

HEAT TREAT FURNACES
1—Lindberg Type 3854 EHV, 107 KW
1—Lindberg Type 6060 EH, 90 KW
1—Lindberg Car Type 72" x 84" x 96" 105 KW

CORE OVENS
1—Thermonic Dielectric Model M800A, 30 KW
1—Coleman Tower 40' high, gas fired
1—Porbeck 8 drawers, oil fired

SHAKEOUTS
1—Simplicity 3' x 5' 1000 lbs. cap.
1—Simplicity 3' x 6' 5000 lbs. cap.
1—Hewitt-Robins 12' x 10' 60000 lbs. cap.
1—Hewitt-Robins 12' x 20' 68 tons cap.

SANDSLINGERS
1—B-P Stationary Riddle Type 19" head, 4" tip
1—B-P Stationary double belt 19" head, 4" tip

SAND MULLERS
Simpson
1—#0, Type "C" 1¾ cuft.
2—#1, Unit drive 4 cuft.
1—#1½, Unit drive 6 cuft.
2—#2 Type "E" 14 cuft.
2—#3 Unit drive 30 cuft.
Clearfield
1—#404, 4 cuft.
2—#610, 14 cuft.
1—#930, 30 cuft.
Beardsley-Piper
2—3½S Mulbaros
1—#50, 14½ to 29 tons per hr.

CUPOLA BLOWERS
Ingersoll-Rand, Roots, Spencer
15 to 75 H.P.

LADLES
3—4 to 6 tons bottom pour Whiting
3—3 ton T-pot
1—1½ ton T-pot
Lip pour ½ to 25 tons

BLAST CLEANING EQUIPMENT
1—27 x 36 Wheelabrator Tumblast
1—42 x 48 Wheelabrator Tumblast
1—48 x 48 Wheelabrator Tumblast
2—26" Wheelabrator Continuous

DUST COLLECTORS
American, Sly, Rotoclone, Northern 600 to 4000 CFM
HANDY SANDYS and REDDY SANDY
single and double hopper type
HINES POPOFF ALUMINUM FLASKS AND JACKETS
large inventory of various sizes

MOLDING MACHINES
Automatic
2—Taccone's Model TDA-4, 24" x 24"

JOLT ROLLOVER & DRAW
Davenport
1—Model 40A, 3500# cap. 24" draw, 40" x 66" table
2—Model SA28, 1500# cap. 12" draw, 30" x 40" table
Herman
1—6000# cap., 40" x 72" table, 40" x 60" bumper
1—750# cap. floor type, 20" x 42" table
International
2—Type "G" 600# cap. 8" draw
2—Type "G" 1000# cap. 10" draw
Johnston & Jennings
2—Model 815, 1200# cap. 15" draw, 30" x 40" table
2—Model 918, 2000# cap. 18" draw, 44" x 54" table
Osborn
4—Model 601 Portable, 10" draw, 24" x 30" flask
2—Model 602 Portable, 11" draw, 26" x 36" flask
2—Model 442 Portable, 10" draw, 600 lbs. cap.
2—Model 444 Portable, 10" draw, 1000 lbs. cap.
2—Model 242 Stationary 12" to 19" draw, 1000 lbs. cap.
1—Model 243 Stationary 12" to 21" draw, 1500 lbs. cap.
1—Model 643 Stationary 17" to 21" draw, 2000 lbs. cap.
4—Model 405 Stationary 18" draw, 3500 lbs. cap.
8—Model 2047-4 Stationary 8" draw
Spo
1—Model 505, 400# cap., 6½" draw, 18" x 23" table
1—Model 508, 1200# cap., 12" draw, 28" x 30" table
Tabor
1—30" x 40" table, 12" draw, 1000# cap.
1—22" x 32" table, 10" draw, 600# cap.

JOLT, ROLLOVER, SQUEEZE, DRAW
Osborn
1—Model 431-4, draw 7", 600# cap.
1—Model 333, draw 9", 750# cap.
Spo
1—Model 917, draw 9", 750# cap.

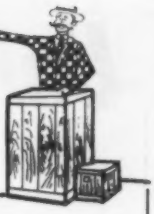
JOLT, SQUEEZE, PIN LIFT
International
1—LJSK, 12" squeeze cyl., 6" draw
3—PKL, 12" squeeze cyl., 8" draw
Osborn
6—710 PJ, 10" Squeeze cyl., 6" draw
6—712PJ, 12" Squeeze cyl., 6" draw
4—716PJ, 16" Squeeze cyl., 7" draw
1—720U, 11" Squeeze cyl., 4" draw
Spo
2—2114G, 11" Squeeze cyl., 4" draw
2—2136, 13" Squeeze cyl., 6" draw
Milwaukee
2—125-3, 12" Squeeze cyl., 8" draw
Davenport
1—Model 34AJS, 2500# cap., 12" draw
Herman
1—20" x 36" table, 1500 lbs. cap.
2—36" x 42" table, 4000 lbs. cap.
Johnston & Jennings
1—1216S, 3000 lbs. cap., 16" draw
Osborn
1—561, 40" x 50" table, 12" draw, 5000# cap.
1—560, 32" x 45" table, 12" draw, 2500# cap.
1—540, 29" x 38" table, 12" draw, 2000# cap.
1—558, 20" x 24" table, 4" draw, 550# cap.
Spo
2—3070, 26" x 35" table, 10" draw
1—3058, 23" x 27" table, 8" draw

PLAIN JOLT
Davenport
2—Model AJ-10, 30" x 48" tabie, 3000# cap.
Osborn
1—Model 103, 54" x 66" table, 6400# cap.

PUSH-OFF JOLT
Champion
4—AL 2424, 8" lift, 2000# cap.
1—AL 3036, 6" lift, 3500# cap.
International
1—LP-6, 8" lift, 1000# cap.
Core Rollover Molding Machines
International, Osborn, Tabor
Jolt Squeeze Molding Machines
Stationary and Portable, 10", 12", 13", 16" squeeze cyl.

ASK FOR OUR COMPLETE LISTING—CALL GLENVILLE 1-1222

THE ACME BARGAIN PAGE



BLOWERS
I.-R. 12900 cfm, 100 h.p. 220-440 V. 20 oz.
GE 10500 cfm., 20 oz., 85 h.p., 220 V.
GE 7500 cfm., 20 oz., 89.6 h.p., 220-440 V.
SPENCER 7350 cfm., 16 oz., 50 h.p.
GE Centrifugal 6200 cfm., 24 oz., 58 h.p.
6000 cfm. INGERSOLL-RAND 32 oz.
SPENCER 3500 cfm., 20 oz., 40 h.p.
SPENCER 2250 cfm., 16 oz., 15 h.p., 220
SPENCER 1350 cfm., 32 oz.
NORTH AMERICAN 1050 cfm, 16 oz.
NORTH AMERICAN 850 cfm.
500 cfm NORTH AMERICAN 12 oz.
McKee 200 cfm
2—SPENCER Turbo 50 hp 4800 cfm 24 oz.
2—SPENCER Turbo 50 hp 3600 cfm 24 oz.

CLEANING EQUIPMENT
27" x 36" American w/skip
48" x 48" AMERICAN w/skip
6' Table PANGBORN
AMERICAN #2 Tablast 8-28" tables, late
PANGBORN GD1-Airblast Barrel
20" x 27" AMERICAN
88" PANGBORN double swingout table
SLY #4 Blast Mills

CONVEYORS
17' BARBER GREEN Bucket Conveyor
1500'—458 Chain w/drive, will sell all or part
24" x 13'-9" Magnet Belt

CONVEYORS, OSCILLATING
24" x 40' Ajax
SIMPLICITY 18" x 24'
SYNTRON 24" x 6'
AJAX 12" x 20'6"
36" x 11' Ajax
8" x 13' Ajax
3' x 10' SIMPLICITY OA-10A

CORE BLOWERS
CB15 55# cores, Universal blow plate
CB5-4# cores
DEMMLER #50
1—DEMMLER #55 w/vibratory hopper
2—DEMMLER #55 w/plain hopper
DEMMLER 2EO
DEMMLER 2K
FEDERAL "SAN-BLO" CB 40
INTERNATIONAL SB 15H, up to 150# cores. Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
6—OSBORN 193 up to 50# cores
REDFORD Bench #2 & #4

CORE GRINDERS
1—MILWAUKEE 70-9

CORE OVENS
THERMONIC INDUCTION MODEL 1800A
2—Despatch ET. Drawer Type

CORE ROLLOVERS
2—INTERNATIONAL GR hand ram power rollover 22" x 24" x 10" draw
INTERNATIONAL REDP Rollover 12" draw
SUTTER #500

CRANES
2—WHITING 10 Ton cap. 107'3⅛" span, OETC Outdoor type
1—WHITING 3 Ton OETC Cupola Charge Crane, 20' span

CUPOLA GUNS
1—Bondactor #1250 and 1000

CUTOFF SAWS
UNUSED DEWALT CUTOFF SAWS for ferrous or nonferrous metals cutoff or as sprue cutters. Flush blade adapter takes up to 20" abrasive blade or saw. Power Hoist to arm. Chain & Sprocket cross feed for working on heavy cast iron 48" x 60" "T" slot table or off table cutting of large work. Motor swivels horizontal to vertical in yoke.

DUST COLLECTORS
PARSONS 40,000 cfm, cloth bag type
ROTOCLONE 8D 2000 cfm 5 hp
SLY #11—590 cfm
ROTOCLONE 8B 2000 cfm w/after cleaner

ELECTRIC MELTING FURNACES
1—DETROIT "LFA" 350# shell 13200 V.
1—DETROIT "LFC" 700# and 350# Tapered Shell 2300 V.

FURNACES
400# Fisher Motorized Tilt, Gas Fired
600# Fisher Stationary
600# Campbell Hausfeld Brass

GRINDERS, MISC.
U.S. #70 Comb. 20" disc & 20"x3"x1¼" wh
53" Hanchett Horizontal Disc
GARDNER 36" Vert Disc
BRADFORD Metalmaster 18" Disc
STANDARD 24" disc & snag

GRINDERS, SNAG
US #64 D.E. 20" x 3" x 10"
#5 Fox Sgl. Wh. 24" snag.
2—KLING type RT H.D. 24" x 3" x 12" D.E.
KLING H.D. 20" x 2" x 7" D.E.
5—#6 FOX Single Wheel 24" Snag
STANDARD 20" x 3" 7½ h.p.
STANDARD 30 hp Type 50—30" x 5"

GRINDERS, SWING FRAME
FOX 24" x 3" x 12", 15 h.p.
MARSCHKE 24" x 3" x 12" 20 h.p., 220 V.
U. S. 24" x 3" x 12" 15 h.p., 220-440 V.
2—MARSCHKE 3 p.h., 12" wheel
1—B&D 7½ h.p.

HEAT TREATING FURNACES
G. E. Elevator Type 1950° Atmosphere Generator 65" x 16' ear. Electric. Late
G. E. Elevator type 2150°—96" x 144" car atmosphere generator. Electric. Late
3—ABBOTT 24" H x 22" Deep x 30" Wide, Gas Fired
HOLDEN #202 1850° Bright Hardening Annealing
HOSKINS 40 KW—1850°
25 KW Westinghouse 2000°

HOISTS
6000# Cleveland w/monotractor travel
6000# Electrolift
15—INGERSOLL-RAND 500# to 6000#
4—2000# R & M
1—500# Ingersoll-Rand LC-4

INDUCTION MELTING EQUIPMENT
30 KW Lepel Spark Gap

LADLES and POURING DEVICES
WHITING 16000# Crane
WHITING 5000# Crane
4000# Industrial Holding
WHITING 28 x 28—2300# Iron
MODERN 1000#—Geared Covered Crane
9—MODERN FA9 Pouring Devices 2000# cap.
6000# WHITING enclosed gear

MOLD BLOWER
TACONNE TD4 24" x 32" flask

MOLD CONVEYOR
366'—51—44" x 66" cars

MOLDING MACHINES
JOLT SQUEEZE PIN LIFT
6—MILWAUKEE 2646 Jolt Squeeze Strip rolloff—rolling molding machines 10" jolt cylinder; 1500# capacity, 28" Squeeze cylinder; 13" draw. Flask size 25½" to 29" wide, 52" long. FACTORY REBUILT.
MILWAUKEE No. 145-2, 27" x 30" table
8—OSBORN 712 PJ 18" x 28" table
1—CHAMPION JSL10P 18" x 21" table 6" draw

JOLT SQUEEZERS
MILWAUKEE 181-7, 24" x 36" table
MILWAUKEE #162—1, 900 lbs. cap.
2—113 PJ SPO
OSBORN 275PJ
25—124 MILWAUKEE Portable Jolt Sq.
6—104 MILWAUKEE Portable Jolt Sq.
8—MILWAUKEE 103-5 17" x 26" table

JOLT ROLLOVER DRAWS
2—918 J & J 2000# cap. 20# draw
643 OSBORN 2000# cap. 20" draw
40" TABOR 2000# cap. 15" draw
30" TABOR 1000# cap. 12" draw
SPO 506
40A DAVENPORT
DAVENPORT 248A 900# 24" x 28" table
HERMAN 3000#
2—750# HERMAN 20" x 30" table
INTERNATIONAL RJ 20" x 12"

JOLT SQUEEZE ROLLOVER DRAW
OSBORN 331-332-333
SPO 413D
INTERNATIONAL RES

PLAIN JOLT
36" x 60" Herman

JOLT PIN LIFTS
1536 MILWAUKEE 1500# cap. 12" draw
1030 MILWAUKEE

MULLERS and MIXERS
1½ SIMPSON U.D. Model 700#
1—#3 UD Simpson
3—#2 Simpson UD
#40 B & P w/skip and water meter
#60 B&P w/spare parts, mtr. & starter
CLEARFIELD #404
1—#2 SIMPSON OG
CLEARFIELD #610

ROLLOVERS
HERMAN 46" x 112" charge conveyor rollover 56" draw, late

SAND CONDITIONERS
AMERICAN 51"
ROYER NDC—ND2
SCREENARATORS S-M-L
JEFFREY Portable Sanditioner 10-15 tph

SAND SLINGERS & EQUIPMENT
3—19"—2 speed Stationary
2—14' Turntables
4—7' Plate Feeders, 35 & 45 Tons
B & P 44-44 Speed Draw 12" draw

SAND SYSTEM EQUIPMENT
33' Newaygo Bucket Elevator 12" x 7"
28' Newaygo Bucket Elevator 12" x 7"
4—7' B&P Plate Feeders, 35 & 45 Tons
2—18" x 52' Magnetic Belt
4' x 8' SIMPLICITY ring crusher screen

SAWS, BAND
30" LAIDLAW, Metal Cutting hydraulic

SCALES
FAIRBANKS charge scale 11250# cap.

SHAKEOUTS
6' x 10' SIMPLICITY, 8om—11, Spring Mounted

4 x 8 LINK-BELT
2' x 8' Double Deck
4 x 6 LINK BELT
6 x 10 HEWITT ROBBINS

SHELL EQUIPMENT
SHELL PROCESS 20" x 30" pattern size w/shell blender and bonding press

SPRUE CUTTERS
1—MILWAUKEE #85 TON
OBERMAYER 2 H.P.

STRAIGHTENING PRESS HYDRAULIC
225 ton Southwark
150 ton Farquhar "C" Frame
60 ton Lempco 4 post
25 ton Fox
25 ton Dennison

TESTING EQUIPMENT
ARLIN Automatic Rockwell, continuous
COLEMAN 55 Spectrophotometer
GOGAN Model 1414-2V
120,000# YOUNG Tensile Tester

TUMBLING BARRELS
ROTO-FINISH Model DW 45-36
SLY, 24" x 48"; 3 H.P.
SLY, 30" x 60" Duplex

WOODWORKING—PATTERNSHOP
OLIVER #290 Dbl Arbor, Tilto-Arbor Saw
1—OLIVER 182D, 15" Disc Sanders
CRESCENT 24" planer
6", 8", 12" 20" and 30" Jointers
24" x 36" Band Saws

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• AIR COMPRESSORS
75 hp I.R. water cooled, horizontal
100 hp WORTHINGTON air cooled, 2 stage

• BLOWERS
CENTRIFUGAL 5 Hp to 30 Hp
GE, WILBRAHAM—GREEN FISHER Positive Pressure & Cent., Cupola Blowers

• BLAST CLEANING EQUIPMENT
15" Cont. WHEELABRATOR Tumblast
26" Cont. WHEELABRATOR Tumblast
20" x 27" WHEELABRATOR Tumblast
27" x 36" WHEELABRATOR Tumblast
36" x 42" WHEELABRATOR Tumblast
48" x 42" WHEELABRATOR Tumblast
48" x 48" WHEELABRATOR Tumblast
48" x 72" WHEELABRATOR Tumblast
1-A WHEELABRATOR Multi-table
72" WHEELABRATOR Swing Table
WHEELABRATOR Pipe Cleaning Cabinet
PANGBORN 8' LF Table
PANGBORN Air Blast Room 8' x 8' x 11'
6' LK PANGBORN Table Room
6' LG PANGBORN Table
9' LG PANGBORN Table
DUST COLLECTORS AND SKIP LOADERS AVAILABLE FOR ALL MACHINES

• CONVEYORS
CARRIER Oscillating, 18" W x 54' L
LINK-BELT, Car type mold, 114 cars, 403' track, car sizes 18" x 42"
SIMPLICITY 24" x 10' Feeder w/hopper, Model OA-10-JA2
Roller Conveyor—Ask for List

• CORE BLOWERS
DEMMLER #1, #2, #2A, #3K
INTERNATIONAL SB-13
OSBORN #91, #192, #91-10
SAN-BLO #40-P-1, 40# core
TACONNE #4D, 10" Draw Stroke Cyl.

• DUST COLLECTORS
COMPLETE STOCK cloth, dry and wet types; 1000 to 17000 CFM

• FURNACES
DIRECT ARC MELTING
500 lb. LECTROMELT, 200 KVA trans.
1000 lb. SWINDELL
2000 lb. HEROULT
2000 lb. SWINDELL, 3/60 1000 KVA
1½ Ton HEROULT
11' Top Charge Furnace

INDIRECT ARC MELTING
10# DETROIT
350# DETROIT LFA
750# DETROIT LFY, Conical Shell
1000# DETROIT AA
3000# DETROIT C, 500 KVA

INDUCTION MELTING & HEATING

700 KW AJAX Induction Mltg. Unit
2 tons/hr. capacity
comp. w/six 500# mltg. fces., 1000 Hp M.G. set, control panels, transformer, circuit breakers.
LATE TYPE in Like New Condition
Send for complete details

30 KW, ECCO Hi-freq. Vacuum Melting
30 KW, LEPEL, water cooled spark gap
35 KVA, AJAX Spark Gap, High Freq.
steel
50 KW to 200 KW TOCCO Units
100 KW AJAX Production Heat Unit

GAS & OIL FIRED
400# & 600# FISHER, MNP
1000# HAUSFELD Hand Tilt, Oil fired, alum or magnesium
1—#900 JC STROMAN, gas, Like new
6000# STROMAN, gas fired
20 Gas & Oil Fired Furnaces

HEAT TREATING
4' x 4' x 10' Gas Fired Annealing
9' x 12' Car Type, gas/oil
210 KW LINDBERG conveyor box type
7' Rotary G.E. 200 K.W. 1950° F
36" x 36" West. Pit Type Electric
10" x 12" x 24" LINDBERG, 2500° F. Hyd
42" x 73' G.E. Roller Hearth, 1950° F.
36 x 96, 45 x 120, 48 x 144 gas fired
Large Stock Gas Fired Box Heat Treating Furnaces

• PIT TYPE ANNEALING
42 x 96, 42 x 120 recirculating gas fired

• GRINDERS
DOUBLE END
3 Hp HISEY WOLF 3/60/220
5 Hp U.S. Model 64, 3/60/220
7½ Hp U.S. Model 66, 3/60/440
15 Hp MARSCHKE 220 volt
25 Hp KLING 3" dia. shaft

SWING FRAME
7½ Hp MUMMERT-DIXON 2/60/220-440
10 Hp SAFETY 24" x 3" wheel
15 Hp MARSCHKE 3/60/220-440
15 Hp MUMMERT-DIXON

• LADLES
BOTTOM POUR
MODERN, 49" x 49"
MODERN Crane Type, 55" H x 50" top
MODERN Crane Type, 60" H x 60" top

LIP POUR
WHITING 28" x 28" top dia. geared
WHITING 29" x 29" top dia. geared
WHITING 52" x 52" top dia. geared
WHITING 33" x 33" top dia. geared

CYLINDRICAL
WHITING, 26" L x 25" dia, 1100# iron
WHITING, 19" L x 22" dia, 600# iron
WHITING, 38" L x 28" dia, 2200# iron

• MATERIALS HANDLING
BYERS Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
HOUGH PAYLOADER, Model HA, 1000# cap., hyd. lift, mech. dump

• OVENS
COLEMAN, Gas, 2 Comp. and 5 drawers, O.D. 22' x 12' x 10'
GIRDLER Thermex Dielectric Core Oven, 15KW w/36" W mesh belt
THERMONIC Dielectric Core Oven, 18 KW, w/40" wide mesh belt

• PRESSES
40 Ton FERRACUTE Sprue Cutter 1⅛" stroke
125 ton R.D. WOOD Down acting, 9" stroke
NIAGARA No. 82 Punch Press

• SAND CONDITIONING
B&P Nite-Gang
B&P Screenarator, Model "M"
LINK-BELT Revivifier
ROYER, NC-2, 10-15 tons/hr, 1½ Hp
ROYER PREPARATOR, Comb., Model NDC, 25 ton/hr scrap removal 8' x 8' hopper
ROYER, NDP, 15-25 tons/hr, 2 Hp
ROYER, "NRP," 40-60 tons/hr, 5 Hp.

• SAND SLINGERS
B&P Stationary, Single Speed
B&P Tractor Type 16" Head
B&P Tractor Type 19" Head
B & P Motive Speed slinger, 2 speed, 22" head, 5" tip

• TESTING MACHINES
3000 Kg Gogan Brinell Testers

TOCCO SALE — INDUCTION HEATING UNITS

2—50 KW TOCCO 9600 cycle, 100 Hp motor
3—50 KW TOCCO JR, 2 station, 9600 cycle, 90 Hp motor
2—80 KW TOCCO JR, 2 station, 9600 cycle, 140 Hp motor
4—100 KW TOCCO JR. 2 station, 9600 cycle, 175 Hp motor
2—200 KW TOCCO JR. 1 station, 3000 cycle, 310 Hp motor

• MOLDING MACHINES
JOLT ROLLOVER PATTERN DRAW
DAVENPORT #408A, 40" x 60" table,
HERMAN 10,000# 48" x 109" table
HERMAN 6000#, 42" x 78"
HERMAN 7500#, 40" x 50" table
HERMAN 3000#, 30" x 66" table
HERMAN 3000#, 32" x 70", 15" cyl. series charging conveyor type
HERMAN 1500#, 30" x 48" table
INTERNATIONAL 27" x 16", Type F, 22" x 64" table
INTERNATIONAL 31" x 16", Type F, 28" x 78" table
INTERNATIONAL 30" x 12", Type G, 28" x 35" table
INTERNATIONAL 13" x 17" table
INTERNATIONAL 43" x 16", type F, 42" x 72" table
J & J #610, 24" x 30" table
OSBORN #243-W, 35" x 40"
OSBORN #602, 36" x 28", 900#
OSBORN #405, 3000#, flask 64" x 57"
TABOR 40" x 60", 1500 & 3000#
TABOR 22" x 42" pattern draw shockless, portable 600#
TABOR 20" x 30" w/air clamp 1000#
TABOR 14" x 16" Rockover 150#
TABOR 40" x 50" table, 3000# capacity

PLAIN JOLT
INTERNATIONAL, 3' x 4' Table, 12" cyl.
TABOR 3' x 4' table

JOLT PIN LIFT
HERMAN #1317, 22" x 30" table
OSBORN #540, 29" x 38" table
SPO #3058, 23" x 27" table
SPO #305, 750 lb. 20" x 27" table
TABOR 20" x 24" table, 600#

JOLT SQUEEZE PIN LIFT
INTERNATIONAL PKL, 20" x 28" table, 14" sq. 5½" draw
INTERNATIONAL PKL, 18" x 24" table, 12" sq., 5½" draw, stat.
MILWAUKEE #163, 15" x 24" table, 11" sq. 1500#
MILWAUKEE #165, 24" x 30" table, 16" sq. 1700#
NICHOLLS 18-44, 6½" draw
OSBORN, #712J, #712PJ, 18" x 28" table, 12" sq., 6" draw, stat. & port.
OSBORN #716 PJ, 22" x 34" table 16" sq., 8" draw
SPO #2114P, 21" x 27" table, 600#
SPO, #2116, 21" x 27" table, 11" sq.

JOLT SQUEEZERS
INTERNATIONAL #12 LJS, 16" x 20"
OSBORN #275J, 16" x 20" table, 400#
SPO #110J, 17" x 20" table, 400#
SPO 113PJ, 18½" x 26" table
TABOR Squeeze-In Head, 16" x 19" table
TABOR Yoke Type, 18" x 26" table

• MULLERS AND MIXERS
B&P No. 3½ Muibaro, 3½ cu. ft.
B&P #30 Speedmuller w/skip, 3 cu. ft.
B&P #40 Speedmuller w/skip, 5 cu. ft
B&P Conventional, SIMPSON type, 87½" Dia., arranged for cooling
B & P #70 Speedmuller, 15 cu. ft. w/cooling.
CLEARFIELD #920, 9' dia., 30 cu. ft.
CLEARFIELD #610, 6' dia., 14 cu. ft.
SIMPSON, #0, U.D., 3' Dia.
SIMPSON #1, U.D., 4' dia., 4 cu. ft.
SIMPSON #1, Sep. Dr., 4' dia., 4 cu. ft.
SIMPSON #1½, Sep. Dr., 4'6" dia., 6 cu. ft.
SIMPSON #2, U.D., 6' dia., 14 cu. ft.
SIMPSON #3, 8' Dia. Sep. Dr., 30 cu. ft.
WHIRLMIX, 31" dia., 200 to 300 lb. sand

• SHAKEOUTS
2' x 10' HEWITT-ROBINS
3' x 10' SIMPLICITY
4' x 5' SIMPLICITY
4' x 6' SIMPLICITY
4' x 8' SIMPLICITY
5' x 6' HEWITT-ROBINS

• TRANSFORMERS (Furnace)
100 KVA KUHLMAN 13,200, 1/60
250 KVA WESTINGHOUSE 6600, 3/60
300 KVA WAGNER 4600, 1/60
500 KVA KUHLMAN 13,200, 1/60
800 KVA PENNA, 23,000, 3/60
1000 KVA WESTINGHOUSE 23,000, 3/60
1000 KVA G.E. 13,200, 3/60
2000 KVA WESTINGHOUSE 13,200, 3/60
5000 KVA WESTINGHOUSE 2300, 3/60
7500 KVA PENNA, 13,200, 3/60

• MISCELLANEOUS
AMERICAN "F" Rod Straightener, ⅜" to 1¼"
BLASTCRETE Model PM-1 Cupola Gun
FLASKS, CORE PLATES, All Sizes
CLIMAX Model 2-A Wire Straightener
CRESCENT Band Saw, 32" wheels
45" Magnet 230V. D. C.
SLY Rd. Tumb. Barrels 68" x 32", 48" x 36"
MOULDER'S Hoppers, Various Sizes
TABOR 10 HP Cut-off Saw

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HN

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SAND SLINGERS
B & P Tractor type, 6' jib, 4' ram arm, 18" head
B & P Stationary Type 6' Jib, 4' Ram Arm, 18" head, 25 HP

MECHANIZED MOLDING SYSTEM
Jeffrey 16 station Overhead Sand System, includes sand storage, muller, mold conveyor, shakeout and sand return.

JOLT SQUEEZERS
Osborn 275J
Osborn 276, 13" Portable and Stationary
International LJS 10"—12"
International PJS 16"
Tabor Top Squeeze 10"
SPO 110J—113J
Champion 10"
Milwaukee 104-5—10"—12"
SPO 2136

JOLT SQUEEZE PIN LIFT
Milwaukee 126 Portable 21 x 27 Table 8" Draw
Milwaukee 145 24 x 30 Table 8" Draw
Osborn 712 18 x 28 Table 6" Draw

International PK18 18" Sq. Cyl 8" Draw 24 x 36 Table

JOLT ROLLOVER DRAW
International "G" 30 x 12
International "F" 45 x 72 x 16" Draw
J&J 612, 25 x 30 x 8" Draw
J&J 815, 30 x 40 x 15" Draw
J&J 918, 44 x 54 table, 18" Draw
Osborn 405 39 x 63 table
Osborn 242W
SPO 508, 28 x 30 x 9" Draw
Tabor 30 x 50 x 12" Draw Shockless

JOLT PIN LIFT
Davenport 34A, 36 x 46 x 12" Draw
J&J 12168, 36 x 54 x 16" Draw
J&J 688, 24 x 30 x 6" Draw
Milwaukee 1536, 32 x 38 x 10" Draw
Osborn 558 20" x 24" x 5" Draw
SPO 3070

JOLT SQUEEZE ROLLOVER DRAW
SPO 9546, 30 x 40 Flask 11" Draw
SPO 920, 32 x 44 Flask 11" Draw
Osborn 332, 26 x 36 Flask 9" Draw

PLAIN JOLTERS
J&J 72 x 72
Tabor 48" x 60"

SAND MULLERS
Simpson Lab Muller, 24"
Simpson Portomuller
Simpson No. 1½ Style C with skip hoist
Simpson 1½ UD w/or w/o skip hoist
Simpson No. 1, Style "H"
Simpson #2 w/skip (open gear)
Simpson #2 UD w/aerator and skip hoist
Simpson #3 UD auto-cycle, dust hood, etc.
B&P No. 3½ Mulbaro
B&P #60 w or w/o Multromatic
Clearfield #404
Clearfield 610
B&P 50 with skip hoist, cooling and water meter
Simpson No. 3, Style C, enclosed gear with skip hoist.

SAND CONDITIONERS
B&P Screenerators, M. L.
B&P Junior Night Gang
National Engineering screening and magnetic separation unit
50" Molders Friend
Royer NDP, Royer NC2, Royer JR
Royer NC4
American Sand Cutter, various sizes
B&P No. 60 Preparator
3 Newaygo Handy Sandys HS7GT
1 Reddy Sandy

SHAKEOUTS
Simplicity 6 x 8
Newaygo Reddy Sandy
Allis Chalmers 8 x 10
Simplicity 4 x 6
Simplicity 4 x 8

CORE BLOWERS
Redford No. 1 and No. 2
Champion, CB15, CB18
Demmler No. 55, 1, 2K, 3E
Hansberg Shooter
Demmler 103EO w/feeder skip hoist, semi-auto cycle
Ross Vibra—Draws
Federal San Blo Pulsator, Model L40P1LPP
B&P Flexiblo, Model No. CB-10-DH w/ Universal Blo Plate

CORE OVENS
Tower oven, various sizes
Batch type, core & mold drying, various sizes
Porbeck 16-2B double and single end five drawer
Foundry Equipment, single end, 5 drawer
Porbeck C3C Double End and Single End, Oil Fired

CUPOLAS
Whiting Nos. 0, 2½, 4, 7, 9, 10
Cupola Blowers, various sizes
Modern swivel charger
Hauck cupola lighter
Series 1000 Bondactor
Cupoliner Model 1500

LADLES AND POURING DEVICES
Modern, Whiting, all sizes plus mixing ladle, electric tilt, cylindrical and tea pot lip pour

NON FERROUS FURNACES
#60 to #250 Crucible & Iron Pot Furnaces, stationary and tilt
Lindberg Fisher Electric Induction
Reda 1000# power tilt type reverberatory
Stroman 1200# Economelt gas fired
Stroman 1600#/hr. reverberatory, 1 station double chamber reverberatory
6000# Fisher Simplex reverberatory complete, gas fired
Lindberg Fisher NMP nose pour, 1000# capacity, gas fired

CLEANING EQUIPMENT
48 x 72 American Wheelabrator with skip and dust collector

42 x 48 American Wheelabrator
36 x 42 American Wheelabrator with skip & dust collector
27 x 36 American Wheelabrator with skip & dust collector
20 x 20 Air Blast Sly Barrel
36 x 72 Sly Tumbling Barrel, gearmotor drive
48 x 48 American Wheelabrator w/skip hoist
American 66" swing table

GRINDERS
Marschke 2 x 24
U. S. No. 65, variable speed 24"
Gardner 54" surface grinder
Mummert-Dixon Swing 15 HP 3 x 24"
Gardner 36" opposed wheel surface grinder

AIR COMPRESSORS
25 H.P. Worthington Air Cooled I.R.
100 HP XRB Ingersoll-Rand 2 stage, horizontal
175 HP XRE 2 stage, synchronous motor
30 HP Ingersoll-Rand horizontal
75 HP Ingersoll-Rand air cooled

AIR HOISTS
Keller one half ton
Curtis Air Cylinder Hoists

ELECTRIC HOISTS
P & H 500#, 1000#
Comet 500#
Cleveland 1000#
Yale 1000#, 6000#
Budgit 1000#

MATERIAL HANDLING EQUIPMENT
Hough Payloaders HA Models
Hyster Forklift 2000#
Towmotor Forklift 7000#
Baker Electric platform 6000#
D. C. Electric Clamshell 1½ Yard
Clamshell Buckets ¾ & 1 Yard
45" Bolted ECM Magnet
50" Bolted Ohio Magnet
55" Bolted Ohio Magnet
130' of 30" roller conveyor, 3½ rollers, 6" centers, 4" channels
Michigan 12B Front End Loader 39" Magnet

2—3 ton Shepard Niles overhead cab operated cranes, 47' span with runway and motor and generator.

TESTING EQUIPMENT
Pittsburgh Brinell Hardness Tester
Sand Testing Equipment
Speedy Moisture Teller
Detroit HB1 Brinell Hardness Tester

MACHINE SHOP EQUIPMENT
Cincinnati #118 automatic mill
Betts 52" Vertical Boring Mill, 2 loading arms
Bridgeport vertical milling machine
Niles Radial Drill 13" x 5' arm
American Radial Drill 14" x 7' arm
Peerless Power Hack Saws, all sizes

MISCELLANEOUS
Tabor cutoff saw 7½ HP
Tessmer, Obermayer, Perkins ¾", 1½" blades, sprue cutters
Walker Turner all angle cutoff saw
C & P core knockout
Magnetic Pulleys
Steel Flasks
Slip Flasks, Jackets
500# Print-O-Matic Dial
American Rod Straightener Type F & H

PATTERNS FOR PRODUCT LINE
Approximately 50 matchplates and other patterns to produce a line of brass plumbing supplies, all jigs, fixtures, dies and special tooling, approximately $7000 *cost* stock finished parts on hand, National Sales distribution of products produced, list of customers and sales representatives.

WANTED! GOOD SURPLUS EQUIPMENT . . . . .

One piece or a complete foundry—ferrous or non ferrous

PARTIAL LISTING OF EQUIPMENT NOW AVAILABLE — INQUIRIES INVITED

SAND MULLERS

CLEARFIELD

MODEL	PAN. DIA.	CAPACITY
404	4'	400 #
610	6'	1500 #

BEARDSLEY & PIPER

MODEL	CAPACITY	AIR COOLED
30	4 cu. ft.	Yes
30	4 cu. ft.	No
60	12 cu. ft.	Yes
60	12 cu. ft.	No
70	15 cu. ft.	No
80	20 cu. ft.	Yes

ALL CAN BE EQUIPPED WITH DUST HOODS, SKIP HOIST LOADERS, MULTRAMATIC CONTROLS, ETC.

SIMPSON

MODEL	PAN. DIA.	CAPACITY	DRIVE
1½	4'-6"	700 #	UD
2	6'	1500 #	Encld.
3	8'	3000 #	UD
3	8'	3000 #	Encld.
3½	9'-3"	5000 #	UD

ALL CAN BE EQUIPPED WITH NATL. ENG. STRAIGHT LIFT SKIP HOIST BUCKET LOADERS.

LANCASTER

MODEL	PAN. DIA.	CAPACITY
EA4	59"	9 cu. ft.
EBG-4	59"	9 cu. ft.

OSCILLATING CONVEYORS

AJAX ENGINEERING (Lo-Veyor)

MODEL	SIZE	CAPACITY in T P H
LC 18-6-24	18" W x 24' L	50
LC 24-6-7	24" W x 7' L	70
LC 24-6-21 FA	24" W x 21' L	70
LC 36-6-9DA	36" W x 9' L	100
LC 36-6-14 DA	36" W x 14' L	100
SIMPLICITY ENGINEERING		
OA-10-JA	24" W x 13' L	150
OA-10-JA	24" W x 11' L	150
OA-10-JA-2	30" W x 7' L	150
OA-10-JA	30" W x 13' L	100
OA-10-A	36" W x 10' L	200
OA-10-A	36" W x 16' L	200
OA-10-A	36" W x 25' L	600

SANDSLINGERS

B&P Stationary, Model "DB," 5' jib arm, 4' ram, 19" head, 5" cup, 2-speed, 20/13 HP. Raising & lowering arms or fixed.
B&P Stationary, Model "DB," 8' jib arm, 4' ram, 19" head, 4" tip, 20/16 HP. Raising & lowering arms or fixed.
B&P "Motive Jr.," 11' jib arm, 4' ram, 16" head, 4" cup, R & L arms, 2-speed, 20/13 HP.
B&P "Motive," 15' jib arm, 9' ram, 2-speed, 25/16 HP. With Raising & Lowering.

HANDY SANDYS

NEWAYGO SHS-4-G Super Handy Sandys, Single Hopper, 15 cu. ft. capacity, 4' receiving hopper, air gates, 21' center elevator.
NEWAYGO SHS4-GT Super Handy Sandy, Twin Hoppers, 25 cu. ft. capacity, 4' receiving hopper, 21' center elevator.
NATIONAL ENGINEERING Moulders Helper. Twin Hopper, 3000 # capacity, each air operated gates.

CUPOLA BLOWERS

INGERSOLL RAND

MODEL	C F M	PRESSURE	HP
FS-337	3000	20 oz.	25
FS-365	4500	16 oz.	30
FS-355	6000	16 oz.	40
FS-387	10.200	20 oz.	75
FS-377	10.500	20 oz.	85
FS-565	14.100	40 oz.	200
ROOTS CONNERSVILLE			
RCR	1040	20 oz.	10
RCS	9075	32 oz.	100

RAREST OPPORTUNITIES! LATEST DESIGN & METHOD! NOW AVAILABLE!

These listed below are exceptional purchases we have been fortunate in making during the last 30 days. Equipment of this caliber has never been offered on the Used Market. Savings of 40 to 60%. Machinery a few years old.

DIELECTRIC CORE OVEN

1—COLEMAN Model CD 75 Dielectric Core Oven 10' Wide 40' Long x 7' High—Mesh Belt Conveyor Type. Belt width 5'—Work area 64" Width x 19" High opening. Power required 165 KVA, 3 Phase, 60 Cycle, 460 Volts. Unit new in 1957 and used less than 3 years. Acquisition cost over $44,000.00—In Like New Condition—Save more than 50%.

TUMBLAST

1—AMERICAN 48" x 72" Tumblast, 30 Cu. Ft. load cap. Complete w/skip hoist loader and all electrical. Serial #A99334. New 1956—Used very little.

SAND MULLERS

1—B&P #50 Speedmullor. 12 Cu. Ft. Batch Cap. Air Cooled. New 1950.
1—B&P #70 Speedmullor. 18 Cu. Ft. Batch Cap. Air Cooled, w/Skip hoist loader. New 1951.
3—SIMPSON #2-F Sand Mullers, 80" pan dia. 2000 # batch cap. New 1955, little usage.
1—CLEARFIELD #920 Sand Muller, 9' pan dia., 3000 # batch cap.

INDUCTION MELTING FURNACES

2—AJAX 20 KW Induction Melting Furnaces, Convertor type, 3000 cycle, w/two 20 # furnaces.
5—AJAX 150 KW Induction Melting Furnaces, 440 V, 60 cycles. 1000 to 1200 # brass cap.
6—AJAX Model CS-1 35 KW Induction Melting & Holding Furnaces. 800 # holding cap., 175 # melting cap.

ELECTRIC DUPLEXING FURNACE

1—WHITING 10 ton Hydro-Arc Furnace for Duplexing Malleable Iron from cupola, 10' dia. shell, motorized tilt 9" dia. electrodes, cap. 18 to 23 ton per hour. w/Allis-Chalmers 2000 KVA transformer, 12,000 volt-motorized tap changer. Unit new 1953.

SPECIAL!

EXCEPTIONAL PURCHASE • INGERSOLL-RAND AIR HOISTS FROM LEADING GOV'T. INSTALLATION • SAVE MORE THAN 50%

QUAN.	MODEL NO.	CAP.	PRICE
6	A	500 #	259.50
5	B	1000 #	279.50
17	C	2000 #	439.50
21	D	4000 #	539.50
13	D-6	6000 #	739.50
7	E	10,000 #	939.50

All equipped with top hooks for hanging; A-430 Trollies and Air Trollies, Extra. Discounts if purchased in quantity.

JOLT ROLLOVER PATTERN DRAW

DAVENPORT

MODEL	TABLE SIZE	DRAW	CAP.
24 8A	24" x 38"	12"	1000 #
28 8A	28" x 40"	12"	1500 #
34 A	34" x 58"	15"	2500 #
48 A	48" x 82"	24"	6000 #
INTERNATIONAL			
AN	40" x open	20"	4500 #
JOHNSTON & JENNINGS			
612	24" x 30"	12"	600 #
815	30" x 40"	15"	1200 #
918	44" x 54"	20"	2000 #
920-RC	44" x 54"	20"	2000 #
1020-RC	50" x 60"	20"	3000 #
OSBORN			
242-W	29" x 42"	12" to 19"	1500 #
244	35" x 52"	16" to 25"	3000 #
405	57" x 84"	26"	3000 #
442	21" x 31"	10"	600 #
601	24" x 30"	10"	900 #
602	30" x 36"	12"	1200 #
643	35" x 50"	20"	2000 #
SPO			
505	18" x 23"	6½"	400 #
506	24" x 25"	10"	600 #
TABOR			
MODEL	TABLE SIZE	DRAW	CAP.
22"	22" x 32"	10"	600 #
22"	22" x 42"	10"	600 #
30"	30" x 40"	12"	1000 #
40"	40" x 60"	15"	3000 #

JOLT PIN LIFT MACHINES

DAVENPORT

MODEL	TABLE SIZE	DRAW	CAP.
34 A-JS	36" x 46"	12"	2500 #
INTERNATIONAL			
JDP 1200x8	24" x 26"	8"	1200 #
JDP 3000x10	48" x 48"	10"	3000 #
JL	32" x 52"	12"	2000 #
JOHNSTON & JENNINGS			
68-8P	25" x 30"	8"	600 #
MILWAUKEE			
1030	28" x 34"	8"	1000 #
1536	32" x 38"	10"	1500 #
2036	32" x 38"	10"	2000 #
2542	38" x 42"	12"	3000 #
3548-6	44" x 46"	12"	3500 #
OSBORN			
540	32" x 52"	12"	2000 #
560	32" x 45"	12"	2500 #
SPO			
3070	26" x 35"	10"	1500 #

JOLT SQUEEZERS

MILWAUKEE

MODEL	TABLE SIZE	SQ. CYL.
104	18" x 15"	10"
123	17" x 26"	12"
141	20½" x 30"	14"
181	24" x 36"	18"
OSBORN		
275-J	16" x 20"	10"
276-J	17" x 26"	13"
SPO		
110-J	17" x 20"	10"
113-P	18½" x 26"	13"

JOLT SQUEEZE PIN LIFT MACHINES

MODEL	TABLE SIZE	DRAW	DIA.	CAP.
PKL-12	18" x 24"	5½"	12"	600 #
PKL-14	20" x 28"	5½"	14"	1000 #
PK-16	20" x 30"	8"	16"	1700 #
MILWAUKEE				
125	21" x 27"	8"	12"	1200 #
145	24" x 30"	8"	14"	1700 #
195	28" x 39"	10"	19"	3000 #
196	16¾" x 39"	10"	19"	3000 #
244	22" x 32"	12"	24"	3000 #
245	35¼" x 42"	12"	24"	5900 #
246	23¼" x 42"	12"	24"	5900 #
OSBORN				
710-PJ	16" x 25"	6"	10"	500 #
712-PJ	18" x 28"	6"	12"	750 #
714-PJ	20" x 31"	7"	14"	1000 #
716-PJ	22" x 34"	7"	16"	1250 #
SPO				
2114-P	20" x 27"	4"	11"	600 #
2136	21" x 30"	6"	13"	800 #
2146	23" x 31"	6"	14"	1000 #

JOLT SQUEEZE ROLLOVER DRAW

MODEL	TABLE SIZE	DRAW	CYL.	CAP.
MILWAUKEE				
167	32" x 33"	12"	16"	1000 #
OSBORN				
332	26" x 36"	9"	16"	750 #
333	32" x 45"	11"	19"	1400 #
SPO				
413-C	24" x 25"	10"	13"	600 #
917-A	26" x 36"	9"	17"	750 #
9546	26" x 32"	12"	16"	1000 #

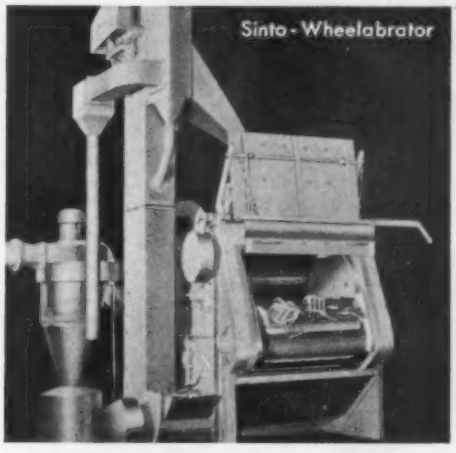
"Built on a Foundation of Mutual Trust"

a MACHINERY AND EQUIPMENT COMPANY

10900 CEDAR ROAD • CLEVELAND 6, OHIO • SW 1-3900

Progressive Foundries Specify **SINTOKOGIO** Equipment

Sinto-Simpson
Mix-Muller



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Sand Preparing Machines
Shot Blasting Machines
Mechanized Foundry Equipment

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Technical cooperation with Wheelabrator Corp. U.S.A.
and Simpson International Ltd. U.S.A.

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HARTLEY
CONTROLS CORPORATION
NEENAH • WISCONSIN
Originators of Fully Automated Sand Systems for Foundries

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STEEL FOUNDRY PRACTICE
By John Howe Hall

496 PAGES 6x9 CLOTH BOUND PRICE $12. POST PAID

This book contains practical information on almost every production problem steel foundrymen encounter. The easy-to-read text is accompanied by over 250 detailed charts, drawings and illustrations.

★

FOUNDRY BOOK DEPT. 1213 W. 3RD ST. CLEVELAND 13, O.

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You Tried the Rest—Now Use the BEST!
Today write for Information Leaflets:

#5 FLUXES FOR ALUMINUM ALLOYS
#6 FLUXES FOR COPPER BASE ALLOYS
#14 MODIGAS COMBINED DE-GASSER AND MODIFIER
#10 CORE ADHESIVES

International Foundry Supply Co., P. O. Box 1053, Reading, Pa.

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Illustration of CROWNFLEX-depressed center wheels mounted on an electric portable grinder.

We are happy to announce the establishment of our new abrasive manufacturing firm. We are presently producing in Delanco, New Jersey the CROWNFLEX line known the world over. CROWNFLEX-offset grinding wheels for use on Swing Frame Grinders and depressed center wheels and cut-off wheels provide safety and long life.

Further specialities: Waterproof Abrasive Paper, "AUTO-PAPER", Resin Fibre Discs, Abrasive Mop Wheel (Flap Wheels)

Ask for offers and samples:

ACAW-American Crownflex Abrasive Wheel Mfg. Corp.

Delanco, N. J., P. O. Box 123, Riverside, N. J., HO-1-6400

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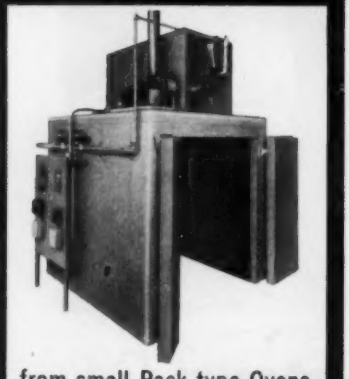
LANLY heat processing equipment for the FOUNDRY INDUSTRY



from small Rack type Ovens to the BIG CAR TYPE OVENS

If a need arises to replace or improve your Foundry Ovens, it is only logical to look to LANLY, recognized authorities in the design and construction of heat processing equipment for more than 22 years.

TODAY may be the opportune time to survey your present facilities and request the counsel of a LANLY representative at no obligation.

THE Lanly CO.

FOUNDRY OVENS 2806 Euclid Ave., Cleveland 15, O.

write for FREE bulletin

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product defects

getting you down?

let us help you...

- find hidden cracks with magnetic particle or dye penetrant inspection equipment
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call any local Picker office where a technical expert is always near (see 'phone book) or write

Picker x-ray

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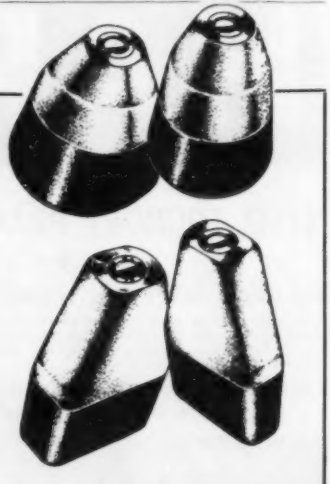

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Over one half million have been used with complete satisfaction. Send for catalog on complete line of butts and peins. We feature 13 types. Sand rammer butts are our business, not our sideline.

ARROW BUTT COMPANY

4800 W. 139th St., Cleveland 35, Ohio

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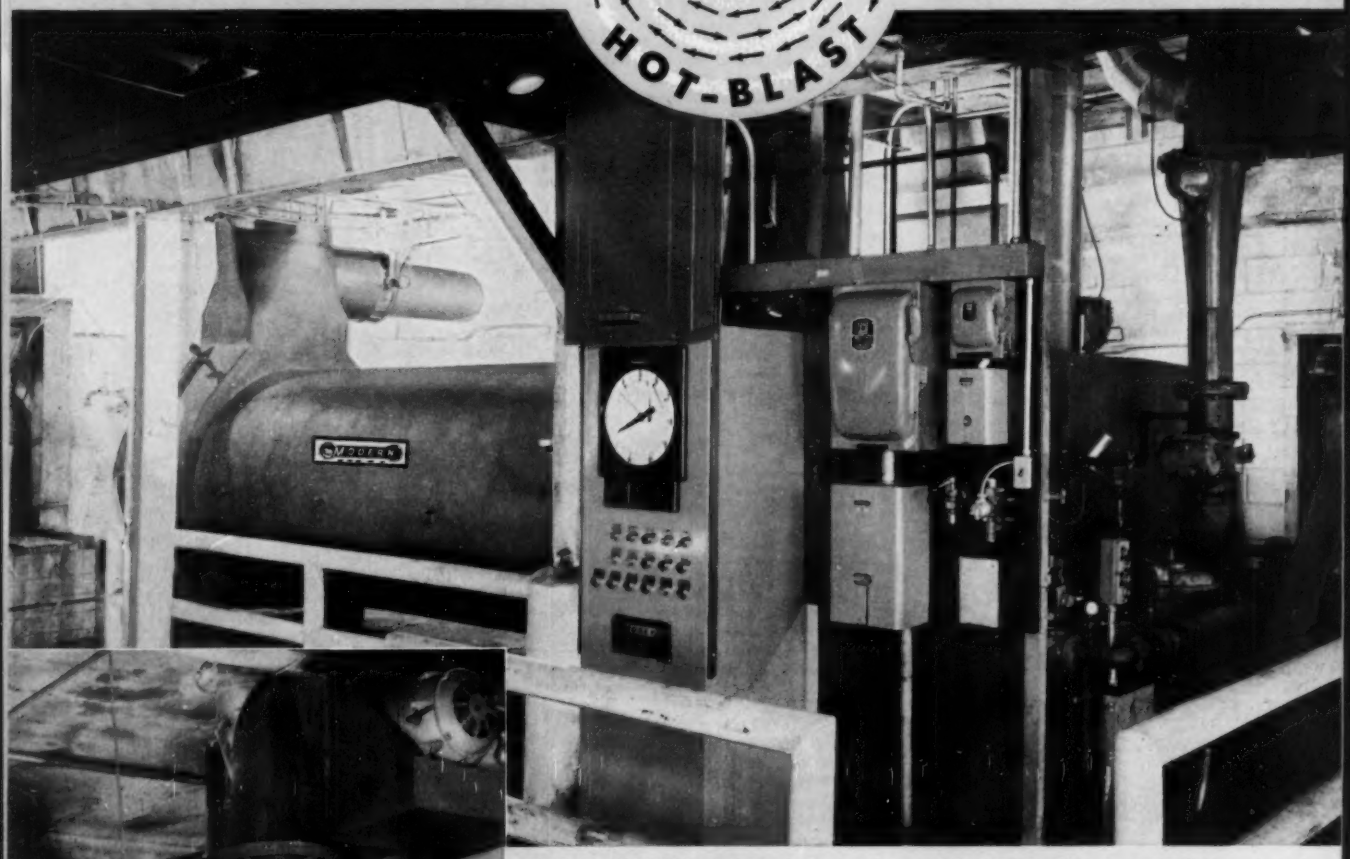

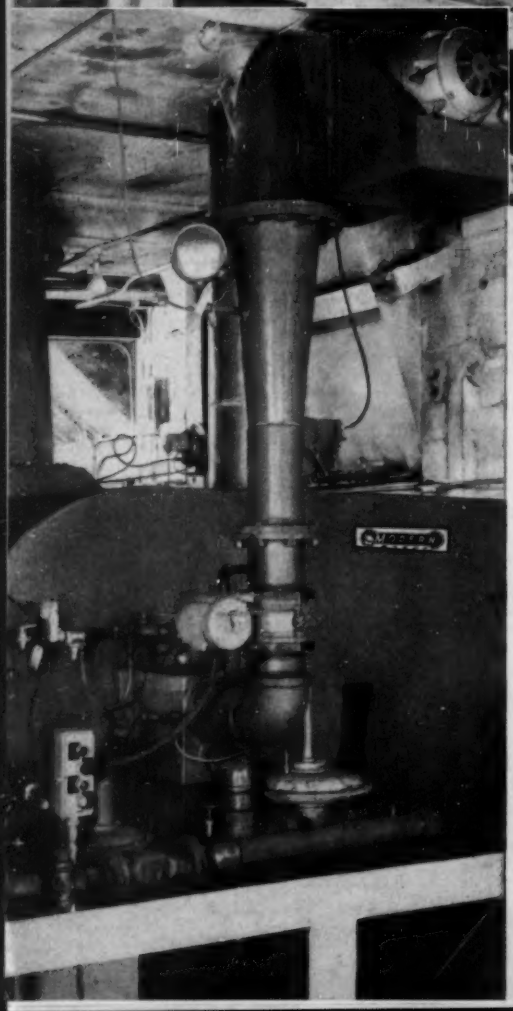

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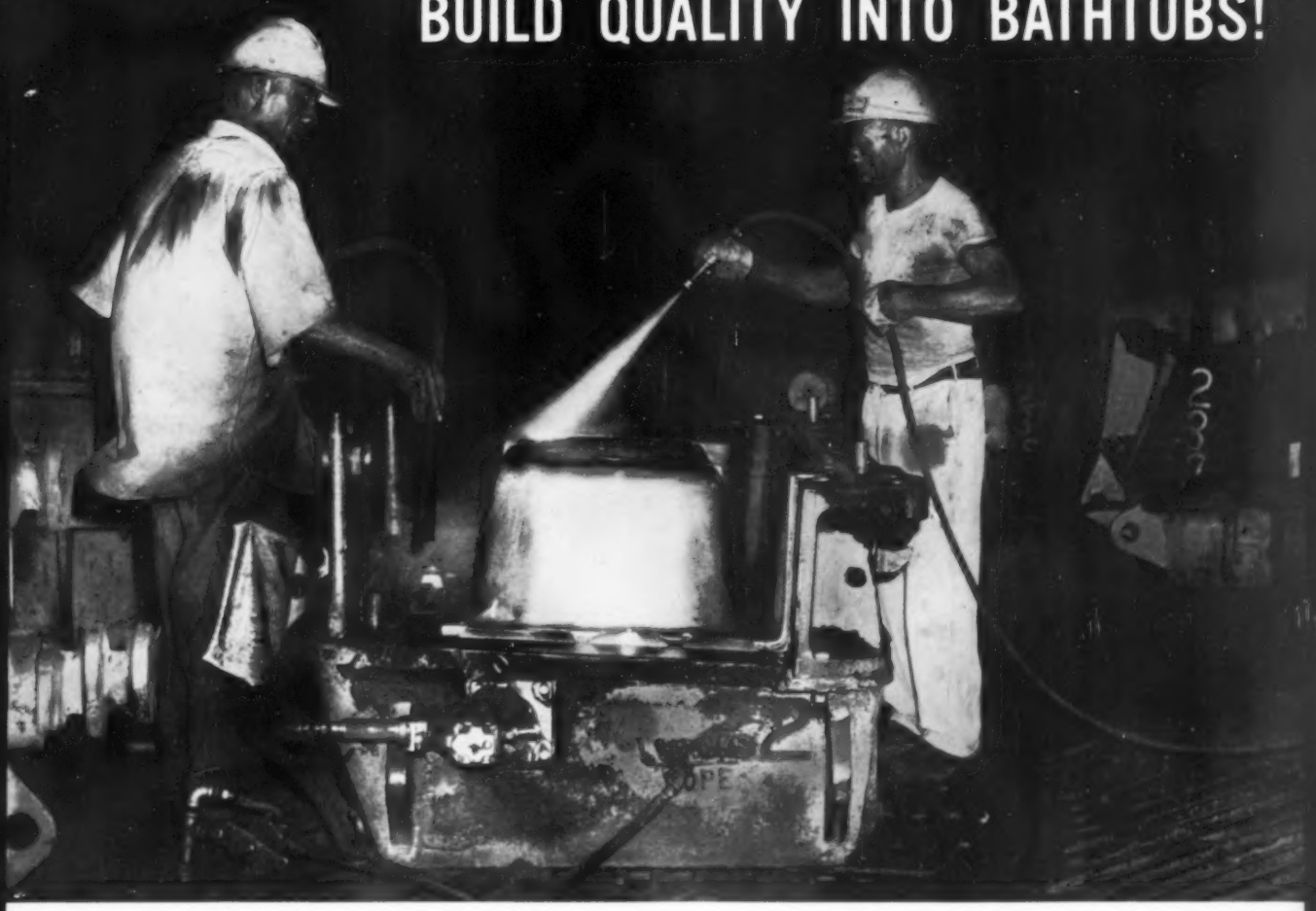

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